National Park Service
U.S. Department of the Interior
Fire Island National Seashore
Patchogue, New York

Fire Island National Seashore

Short-term Community Storm Surge Protection Plan

Environmental Assessment

June, 2003

TABLE OF CONTENTS

List of Tables

List of Figures

EXECUTIVE SUMMARY

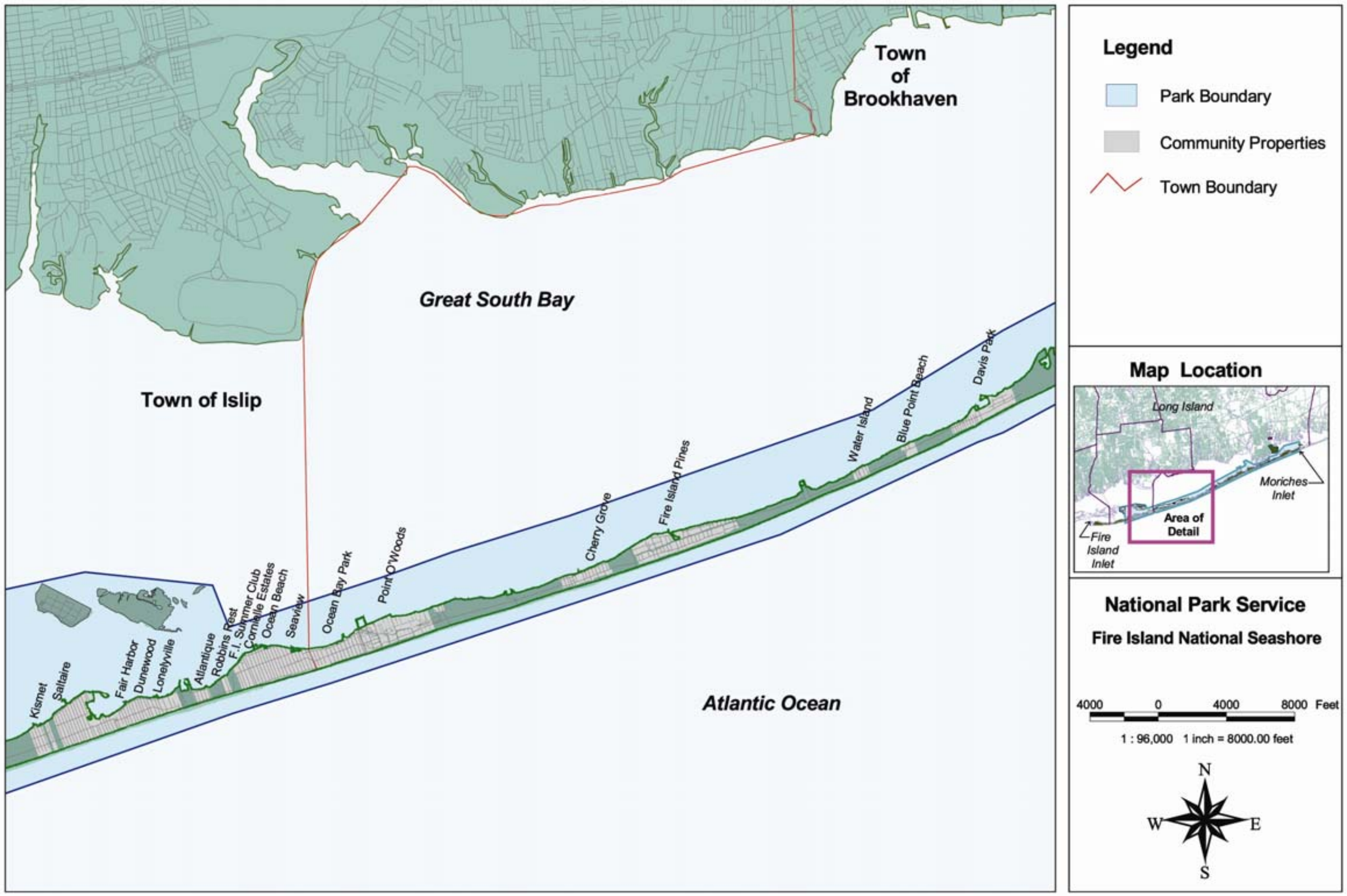
This environmental assessment (EA) was prepared under the National Environmental Policy Act (NEPA) and the National Park Service's NEPA guidelines, Director's Order 12 (DO12). (It describes and analyzes the types of projects that Fire Island communities may wish to apply for permits to implement before the end of 2005 that could affect the beaches and dunes within the borders of Fire Island National Seashore (FIIS) (Figure 1)). These projects are generally intended to address beach change or erosion processes in order to protect structures from storm damage and flooding. Of the 32 miles of shoreline within FIIS, only the 6 miles within the designated community's property would be considered for such projects under this EA. No projects will be allowed which will preclude the implementation of the U. S. Army Corps of Engineers (ACOE) Fire Island to Montauk Point Reformulation Plan (FIMP) or lead to the building of structures in violation of New York State's Coastal Erosion Hazard Area regulations, and/or the Federal Dune District. The National Park Service (NPS) requires the issuance of special use permits before any such projects may be undertaken within FIIS. Before a decision can be made on a permit application, NPS must comply with NEPA, Director's Order 12, Director's Order 53 covering Special Park Use Permits, the National Park Management Policies, 2001, and other relevant statutes and regulations.

Fire Island community residents want to prevent storm damage and flooding to their private property within the park boundaries. NPS, as the regulatory steward for the public, is mandated to protect park natural and cultural resources, values, and public access. Fire Island National Seashore, along with a small number of other NPS units, has unique provisions which allow private development to occur within the boundaries of the park, as long as it does impair park resources. Past beach nourishment, scraping, and other related projects on Fire Island were evaluated on an ad hoc basis. The NPS has determined that this approach did not fully consider. Additionally, separately assessing each individual project is not always possible within a timetable necessitated by unpredictable and dynamic coastal processes. What happens on one community beach may affect other community and federal beaches due to littoral sand transport and ecological and socio-economic interrelationships. NEPA and Director's Orders 12 and 53 require NPS to address similar or connected projects, analyze their cumulative impacts, objectively evaluate alternatives, and provide a mechanism to evaluate their consistency with park laws and purposes.

This EA is intended to accomplish this more holistic and comprehensive environmental review. It will provide a framework for determining when and under what conditions NPS may issue a special use permit to communities for protection of private property for beach stabilization or nourishment projects before the end of 2005 or upon approval of the ongoing Reformulation Plan, whichever comes first.

Short Term Community Response to Storm Surges

Figure 1 - Location Map



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PURPOSE AND NEED FOR ACTION

The purpose of this environmental assessment (EA) is to provide an NPS framework for evaluating under what conditions it is appropriate to approve and permit the private community sand manipulation projects designed to lessen the threat of storm damages to private property within the six (6) miles of private communities located on Fire Island. The NPS Special Use Permits (SUP's) will allow some sand manipulation of the beach and dune configuration for providing temporary storm surge protection until the findings of the ongoing FIMP are available and more permanent approach can be implemented.

This EA is intended to evaluate those alternatives that communities may request before the long-term FIMP is developed and implemented. It is understood in developing this EA that project size and scope is a sensitive matter since both the FIMP and the previously proposed Fire Island Interim Project (FIIP) both required Environmental Impact Statements beyond the scope of this EA. This EA specifically describes short-term projects of limited scale, and magnitude whose effects are neither major or of long term duration. These projects are beneath the scale and magnitude of the FIMP and FIIP projects. This EA is designed so that any approved projects will not preclude the alternatives discussed in the FIMP.

The 6-mile project area is subject to cyclic storm damage due to a combination of historical and ongoing human activities, natural coastal processes, and storm events. Historical human activity that includes dredging of channels, interruption of sediment deposits, the stabilization of Fire Island and Moriches Inlets (in 1941 and 1952, respectively), etc. It also includes the construction of beachfront homes in locations that have contributed to the destabilization of the barrier island's dune system, it's most potent natural protective feature. This changing shoreline is a natural coastal process and storm events that have an effect on this human altered environment have gradually reduced the width and height of the beach and dunes. The rate of shoreline retreat which has occurred at Fire Island is consistent with the level of sea level rise of the ocean's surface. The specific natural forces that cause structural damage are shoreline recession (erosion during a storm), inundation (flooding), and wave attack. Natural processes also deposit sand on the beaches in cycles of lower storm activity. The natural "anchor" for sand is the network of beach grass rhizomes (roots) and tendrils. Where beach grass has been sheared by vehicles or pedestrians, or shaded by or removed for houses and other structures, the ability of the beach to accrete or dunes to rebuild can be impeded.

Barrier islands such as Fire Island provide unique ocean-side habitat and protection from the flooding and erosion of the mainland shorelines. Northeasters and hurricanes periodically strike the southern shores of Fire Island and the shoreline of the Great South Bay. These storms produce tides and waves that flood the bay shoreline of Long Island and cause a rolling over of the barrier island inland. Natural barrier island shorelines act as energy absorbing sponges, which are formed and are maintained by storm energy. These natural processes actually maintain the barrier island system by transporting sand to the back of the island as a platform for marsh to grow and have been observed along the Atlantic coast for centuries. However, the Fire Island barrier has been narrowing. The FIMP will be addressing whether bayside dredging, bulkheading, or prevention of overwash are contributing to bayside erosion.

If a major, catastrophic storm were to occur, none of the action alternatives evaluated in this EA would be likely to prevent significant loss of property and potentially human life. All of Fire Island is within the 100 year flood plain. The 1938 hurricane, which has been estimated as between a 40 to 100 year storm, only caused overwash of 1/4 to 1/3 of Fire Island (Moffatt and Nichols, 1999; Leatherman and Allen, 1985; ACOE, 1977.) Yet it opened seven breaches along the length of the barrier islands south of Long Island. Therefore, severe damage may occur at intervals which would hopefully not arise during the term of this EA. However, storms of lesser intensity are more likely to occur and the beach manipulation applications being evaluated under this EA are designed to forestall property damage from the smaller, more frequent and more likely storm events.

Responding to times of dune and beach recession, Fire Island communities have taken substantial measures over the last 40 years, including beach scraping, dune creation, and installation of sand fences and dune vegetation. These efforts have been supplemented with periodic local and federal nourishment projects, particularly after major storm events. Between 1955 and 1994, approximately 6.4 million cubic yards of fill were placed on Fire Island by the federal government, local municipalities, and local interests. Approximately 54 percent of this fill activity occurred during the 1960’s in response to the severe erosion caused by Hurricane Donna (1960) and the Ash Wednesday storm of 1962. Some 1.66 million cubic yards of fill was placed on Fire Island’s beaches more recently, between 1993 and 1997. Most of this latter fill was placed by local communities at Fire Island Pines, Ocean Bay Park, Fair Harbor, and Saltaire in response to the severe storms that occurred during the early 1990’s.

Despite the various efforts to rectify conditions, much of this fill has now dissipated and severe erosion of the protective dunes has left many of the island’s natural features, past fill projects, homes and other man-made structures vulnerable to even minor storms. The lack of seaward dry beach constrains access for emergency vehicles, NPS patrols, and residents. Options for emergency response and evacuation in these areas are limited to the narrow pathways through the island’s center in times of high tides.

OBJECTIVES IN TAKING ACTION

The objective of this EA is to evaluate the proposed actions and alternatives that may provide communities with temporary storm surge protection before the end of 2005 or upon approval of the Reformulation Plan. The FIMP is intended to provide more permanent protection and to restore a more natural functioning dune system. The second objective is to develop an effective NPS special use permit framework and criteria for efficient response to communities/applicants that are applying for permits from FIIS to perform beach scraping and nourishment projects.

Background/Context

Fire Island, like most barrier islands, was formed many thousands of years ago. The sediments comprising Fire Island were initially deposited at the end of the last Ice Age, 18,000 years ago. There are two source types: the glacial till (boulders to clay-sized material) exposed at least 30 miles to the east, near Montauk Point, and glacial outwash sand that was deposited offshore by meltwater. During the period of sea level rise with glacial retreat over the last 18,000 years, waves have eroded, transported, and re-deposited the sediment along the coast. Sea level rise during glacial periods slowed about 9,000 years ago and is believed to have formed the ancestral barriers, which were augmented about 4,000 years ago when further sea level rise favored more growth of barrier islands environments (Schwab et al. 2000). These barriers are now migrating shoreward in response to the most recent increases in relative sea level rise rates. The rate of shoreline retreat observed at Fire Island is consistent with observed levels of sea level rise (Allen personal communication). This effect is more pronounced in the east with steeper offshore slopes and higher frequency of inlet formation. As a result, the large barrier lagoon at Great South Bay is to the west and smaller lagoons at Moriches and Shinnecock are found in the east (Allen 2002).

The unusual oblique East-West geographic orientation of Fire Island on the Atlantic Coast results in different beach and dune responses to northeast coastal storms than the more usual east-facing beaches. This south-facing shoreline responds to storms occurring well to the south, including offshore hurricanes. Regional storms also have beach change and flooding impacts on Fire Island beaches due to local wind-generated waves and ocean set-up.

Estimates of the sediment budget for the south shore of Long Island have yielded approximate scales of the net alongshore sediment transport rate as ~100,000 cubic yards per year from the headlands near Montauk Point, gradually increasing to ~200,000 cubic yards per year along the barrier islands/inlets from the Hamptons to Watch Hill, and increasing to over ~400,000 cubic yards per year at Democrat Point. The sediment transport rate means the net amount of sediment which moves through the system; the differences in the rate from east to west means that the system is more sediment laden in the west. The increase along the western half of Fire Island is due to shedding of sediment from the remnants of an old (greater than 65 million years) drowned headland remnant off of Watch Hill (Schwab et al., 2000).

The principal forces of concern are the storm-induced, extreme tides and waves that could cause flooding and damage to structures within communities on the barrier island. The fundamental causes of the shoreline change experienced at Fire Island are storms, the location of off-shore bars and breaks in the bars, the natural patterns of littoral drift, and rising sea levels. The concern with structures located on the dunes is that their presence can prevent or interfere with natural dune replenishment and protection, making landward areas more vulnerable to storm events. In the most severe scenario, overwash, breaching and inundation of the human infrastructure in the project area could subject communities to socioeconomic losses.

With the exception of bayside bulkheading, human activities are believed to have a minor effect on shoreline change of beaches and dunes within Fire Island National Seashore (FIIS) in comparison to the effects of natural processes. Human activities have and continue to influence or exacerbate localized effects of structures and activity on the dunes resulting in damage to the dune and its natural stabilizing vegetation.

The shoreline manipulation projects conducted by the Army Corps of Engineers to the east at Moriches and Shinnecock Inlets, and in the Village of Westhampton, had and are still causing localized impacts but are not affecting observed shoreline change within the National Seashore. Over the past decade, shoreline change previously caused by the Moriches Inlet project has been reversed by the naturally occurring by-pass process at the inlet.

Additionally, beach nourishment and scraping into artificial dunes to provide storm protection to oceanside community structures has led to non-functional dune ecosystems, which no longer provide the benefits of natural dunes, and often decreased beach width along with its storm protection features. Available monitoring data indicate that natural processes of dune recovery in the 1990s have resulted in the rebuilding of the seaward face and increased the elevation of the dune crest without compromising beach width. Natural dune recovery has been documented within a few years at several areas on Fire Island. At Old Inlet, dunes were formed within a year following overwash events. Allen et. al (2002) describe artificial dune building in some of the western communities as less than optimal in reducing future storm damage. It has also been shown that an artificial dune placed in advance of the primary dune system requires continual replenishment efforts. Naturally developed dunes are stabilized naturally by beach grass rhizomes and withstand shoreline change more effectively.

PURPOSE OF FIRE ISLAND NATIONAL SEASHORE

National park system units are established by Congress to fulfill specified purposes, based on the park's unique and "significant" resources. A park's purpose, as established by Congress, is the fundamental building block for its decisions to conserve resources unimpaired while providing for the "enjoyment of future generations." The enabling legislation for Fire Island National Seashore, its purpose and significance, and its broad mission goals are summarized in this section and are taken from the national seashore's enabling legislation, the 1977 *General Management Plan,* and the 2000 *Strategic Plan* (NPS 1977; NPS 2000d*).* In addition, the national seashore's purpose, significance, and management objectives are all linked to the impairment findings that are made in the NEPA process, as stated in section 1.4.5 of the National Park Service *Management Policies 2001* (NPS 2000c*).*

Establishment — Congress established Fire Island National Seashore on September 11, 1964 (Public Law [PL] 88-587). Congress highlighted the conservation and preservation of beaches, dunes, and other natural features as the reason for creating Fire Island National Seashore (FIIS). The enabling legislation authorizes the establishment of Fire Island National Seashore:

For the purpose of conserving and preserving for the use of future generations certain relatively unspoiled and undeveloped beaches, dunes, and other natural features within Suffolk County, New York, which possess high values to the Nation as examples of unspoiled areas of great natural beauty in close proximity to large concentrations of urban population, the Secretary of the Interior is authorized to establish an area to be known as the "Fire Island National Seashore" (16 USC 459e(a)).

The national seashore extends from the easterly boundary of the main unit of Robert Moses State Park eastward to Moriches Inlet and includes Fire Island proper and the surrounding islands and marshlands in the Great South Bay, Bellport Bay, and Moriches Bay adjacent to Fire Island. Sexton Island, West Fire and East Fire Islands, Hollins Island, Ridge Island, Pelican Island, Pattersquash Island, and Reeves Island and other small and adjacent islands, marshlands, and wetlands that lend themselves to contiguity and reasonable administration within the national seashore; and in addition the waters surrounding the national seashore to distances of 1,000 feet in the Atlantic Ocean and up to 4,000 feet in Great South Bay and Moriches Bay (see Location map). The mainland terminal and headquarters are on the Patchogue River within Suffolk County, New York.

Administration — Fire Island National Seashore is fragmented with lands owned by the federal government, local agencies, private individuals, and county parks. National seashore staff maintain and administer the Otis Pike Wilderness Area established in 1981, the Sunken Forest, Watch Hill, Sailors Haven, the Fire Island Lighthouse (placed on the National Register of Historic Places in 1981), and the William Floyd Estate (placed on the National Register of Historic Places in 1980).

The national seashore enabling legislation states "the Secretary shall administer and protect the Fire Island National Seashore with the primary aim of conserving the natural resources located there (16 USC 459e-6(a))." The legislation further states:

The area known as the Sunken Forest Preserve shall be preserved from bay to ocean in as nearly its present state as possible, without developing roads therein, but continuing the present access by those trails already existing and limiting new access to similar trails limited in number to those necessary to allow visitors to explore and appreciate this section of the seashore (16 USC 459e-6(a)).

Access to [the Davis Park-Smith Point County Park area] of the seashore lying between the easterly boundary of the Ocean Ridge portion of Davis Park and the westerly boundary of the Smith Point County Park shall be provided by ferries and footpaths only, and no roads shall be constructed in this section except such minimum roads as may be necessary for park maintenance vehicles. No development or plan for the convenience of visitors shall be undertaken therein which would be incompatible with the preservation of the flora and fauna or the physiographic conditions now prevailing, and every effort shall be exerted to maintain and preserve this section of the seashore as well as that set forth in the preceding paragraph in as nearly their present state and condition as possible (16 USC 459e-6(b)).

In administering, protecting, and developing the entire Fire Island National Seashore, the Secretary shall be guided by the provisions of sections 459e to 459e-9 of [Title 16] and the applicable provisions of the laws relating to the national park system, and the Secretary may utilize any other statutory authority available . . . for the conservation and development of natural resources to the extent . . . that such authority will further the purposes of sections 459e to 459e-9 of [Title 16]. Appropriate user fees may be collected notwithstanding any limitation on such authority by any provision of law (16 USC 459e-6(c)). Development restrictions for the Dune District is further defined in 16 U.S.C. Sec. 459e-1, the Dune District legislation provides: "(g) The authority of the Secretary to condemn undeveloped tracts within the Dune District as depicted on map entitled 'Fire Island National Seashore' numbered OGP-0004 DATED May 1978, is suspended so long as the owner or owners of the undeveloped property therein maintain the property in its natural state."

Mission — The NPS mission statement at Fire Island National Seashore grows from the park's legislated mandate and is a synthesis of the park's mandated purpose and its primary significance (NPS 2000d):

The National Park Service is committed to preserving Fire Island National Seashore's cultural and natural resources, its values of maritime and American history, barrier island dynamics and ecology, biodiversity, museum collection objects, and wilderness. The National Park Service is committed to providing access and recreational and educational opportunities to Fire Island National Seashore visitors in this natural and cultural setting close to densely populated urban and suburban areas, and to maintaining and exemplifying the policies of the National Park Service.

Purpose — The purposes of Fire Island National Seashore, as stated in its *Strategic Plan* (NPS 2000d), are as follows:

- Preserve the natural and cultural resources within administrative boundaries.

Natural resources include Fire Island proper, a 32-mile barrier island off the south shore of Long Island, NY; surrounding waters (1,000 feet into Atlantic Ocean and 4,000 feet into Great South and Moriches Bay); and 26 smaller bay islands. Cultural resources include the park museum collection, the William Floyd Estate, and land and structures comprising the Fire Island Light Station.

- Permit hunting, fishing, and shellfishing within boundaries in accordance with U.S. and New York State laws.

- Preserve the Sunken Forest tract from bay to ocean without developing roads therein.

- Preserve the main dwelling, furnishings, grounds, and outbuildings of the William Floyd Estate, home of the Floyd family for eight generations.

- Administer mainland ferry terminal and headquarters sites not to exceed 12 acres on the Patchogue River.

- Preserve the Otis Pike Fire Island High Dunes Wilderness.

- Provide for public access, use, and enjoyment.

- Work with the communities within the park to mutually achieve the goals of both the park and the residents.

Significance — Fire Island National Seashore's primary significance is stated in its *Strategic Plan* as follows:

- Fire Island National Seashore is a relatively natural seashore comprised of relatively unspoiled and undeveloped beaches, dunes, other natural features, and a diverse barrier island ecosystem. The seashore is near large concentrations of urban populations and contains no paved road.

- Seventeen communities help define the human environment of Fire Island National Seashore.

- The Fire Island Light Station tells the story of the lifesaving ethic embodied in the U.S. Lighthouse Service, the U.S. Life Saving Service, and the U.S. Coast Guard.

- The William Floyd Estate, associated with General William Floyd, a signer of the Declaration of Independence, was owned and occupied by the Floyd family for 250 years; tangible features from all periods are preserved and interpreted there.

- The Sunken Forest is a 250–300 year old American holly-shadblow-sassafras maritime forest considered to be at or near climax.

- The Otis Pike Wilderness Area contains a variety of barrier island ecosystem in a relatively natural state and is the only federal wilderness in the state of New York.

RELATED NPS LAWS, REGULATIONS, PROGRAMS AND POLICIES

National Park Service Management Policies

4.8.1 Protection of Geologic Processes

The Service will allow natural geologic processes to proceed unimpeded. Geologic processes are the natural physical and chemical forces that act within natural systems, as well as upon human developments, across a broad spectrum of space and time. Such processes include, but are not limited to, exfoliation, erosion and sedimentation, glaciation, karst processes, shoreline processes, and seismic and volcanic activity.
Geologic processes will be addressed during planning and other management activities in an effort to reduce hazards that can threaten the safety of park visitors and staff and the long-term viability of the park infrastructure.
Intervention in natural geologic processes will be permitted only when:

- Directed by Congress;
- Necessary in emergencies that threaten human life and property;
- There is no other feasible way to protect natural resources, park facilities, or historic properties; or
- Intervention is necessary to restore impacted conditions and processes, such as restoring habitat for threatened or endangered species.

4.8.1.1 Shorelines and Barrier Islands

"Natural shoreline processes (such as erosion, deposition, dune formation, overwash, inlet formation, and shoreline migration) will be allowed to continue without interference.

Where human activities or structures have altered the nature or rate of natural shoreline processes, the Service will, in consultation with appropriate state and federal agencies, investigate alternatives for mitigating the effects of such activities or structures and for restoring natural conditions. The Service will comply with the provisions of Executive Order 11988 (Floodplain Management) and state coastal zone management plans prepared under the Coastal Zone Management Act of 1972.

Any shoreline manipulation measures proposed to protect cultural resources may be approved only after an analysis of the degree to which such measures would impact natural resources and processes, so that an informed decision can be made through an assessment of alternatives.

Where erosion control is required by law, or where present developments must be protected in the short run to achieve park management objectives, including high-density visitor use, the Service will use the most effective and natural appearing method feasible, while minimizing impacts outside the target area.

New developments will not be placed in areas subject to wave erosion or active shoreline processes unless (1) the development is required by law; or (2) the development is essential to meet the park's purposes, as defined by its establishing act or proclamation, and:

- No practicable alternative locations are available,
- The development will be reasonably assured of surviving during its planned life span, without the need for shoreline control measures, and
- Steps will be taken to minimize safety hazards and harm to property and natural resources."

NPS Organic Act and Management Policies

By enacting the National Park Service Organic Act of 1916, Congress directed the U.S. Department of the Interior and the National Park Service to manage units of the national park system "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 USC 1). The Redwood National Park

Expansion Act of 1978 reiterates this mandate by stating that the National Park Service must conduct its actions in a manner that will ensure no “derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress” (16 USC 1a-1).

Despite these mandates, the Organic Act and its amendments afford the National Park Service latitude when making resource decisions that balance visitor recreation and resource preservation. By these acts Congress “empowered [the National Park Service] with the authority to determine what uses of park resources are proper and what proportion of the parks resources are available for each use” *(Bicycle Trails Council of Marin v. Babbitt,* 82 F.3d 1445, 1453 (9th Cir. 1996)).

Courts consistently interpreted the Organic Act and its amendments to elevate resource conservation above visitor recreation. *Michigan United Conservation Clubs v. Lujan,* 949 F.2d 202, 206 (6th Cir. 1991) states, “Congress placed specific emphasis on conservation.” The *National Rifle Ass’n of America v. Potter,* 628 F. Supp. 903, 909 (D.D.C. 1986) states, “In the Organic Act Congress speaks of but a single purpose, namely, conservation.” The NPS *Management Policies* also recognize that resource conservation takes precedence over visitor recreation. The policy dictates “when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant” *(Management Policies 2001,* sec. 1.4.3).

Because conservation remains predominant, the National Park Service seeks to avoid or to minimize adverse impacts on park resources and values. Yet, the National Park Service has discretion to allow negative impacts when necessary *(Management Policies 2001,* sec. 1.4.3). However, while some actions and activities cause impacts, the National Park Service cannot allow an adverse impact that constitutes a resource impairment *(Management Policies 2001,* sec. 1.4.3). The Organic Act prohibits actions that permanently impair park resources unless a law directly and specifically allows for the acts (16 USC 1a-1). An action constitutes an impairment when its impacts “harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values” *(Management Policies 2001,* sec. 1.4.4). To determine impairment, the National Park Service must evaluate “the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts” (*NPS 2000a*).

Because park units vary based on their enabling legislation, natural resources, cultural resources, and missions, the recreational activities appropriate for each unit and for areas within each unit vary. An action appropriate in one unit may impair resources in another unit. Thus, this environmental assessment analyzes the context, duration, and intensity of impacts related to beach alteration/stabilization activities at Fire Island National Seashore, as well as potential for resource impairment, as required by *Director's Order #12: Conservation Planning, Environmental Impact Analysis and Decision-making* (NPS 2001a).

National Park Service Regulations, 36 CFR Parts 2.1, 2.2, and 2.3

Section 2.1 prohibits the possessing, destroying, injuring, defacing, removing, digging, or disturbing from its natural state, all natural, cultural, and archeological resources. This includes all wildlife and plants, either dead or alive, as well as ensuring the preservation of all natural features, paleontological resources, cultural or archeological resources, and mineral resources. Superintendents are allowed to specify certain parameters where specific actions are allowed for each park.

Section 2.2 prohibits the taking of wildlife, except by authorized hunting and trapping activities; feeding, touching, teasing, frightening or intentional disturbing of wildlife nesting, breeding or other activities; possessing unlawfully taken wildlife or portions thereof.

Section 2.31 Identifies that all lands within a park boundary, regardless of ownership, shall be protected from trespassing, tampering and vandalism. This is further defined in this section by prohibiting the following,

(1) Trespassing. Trespassing, entering or remaining in or upon property or real property not open to the public, except with the express invitation or consent of the person having lawful control of the property or real property.
(2) Tampering. Tampering or attempting to tamper with property or real property, or moving, manipulating or setting in motion any of the parts thereof, except when such property is under one's lawful control or possession.
(3) Vandalism. Destroying, injuring, defacing, or damaging property or real property.

1977 General Management Plan

The 1977 *General Management Plan* was created to provide an environmentally sound management foundation for the national seashore. The plan ensures the protection and preservation of beaches, dunes, and other natural features, as well as provides reasonable access and facilities for recreational uses. Because a variety of landowners and governmental jurisdictions are affected by management at Fire Island National Seashore, planning and management activities discussed in the plan are based on cooperative efforts. The *General Management Plan* states that ocean-facing dunes will be repaired or restored as needed…Such measures will be undertaken by affected communities. It further clarifies, "Dune blowouts and other naturally occurring bare sand areas will be repaired or replanted in the seashore district when compelling considerations, such as threats to major developments, dictate such action. In the development district, dune blowouts that endanger homes during extreme high tides or moderate-intensity storms may be filled and replanted, following evaluation of the need for such actions (NPS 1977). “Attempts will be made to restore and maintain the dune and beach system by environmentally compatible methods that acknowledge the inevitable erosional transformation of the island, a result of a rising sea level, great hurricanes, and severe northeasters” (NPS 1977).

2000 Strategic Plan, Fiscal Years 2001–2005

The *Strategic Plan* addresses topics such as the mission of Fire Island National Seashore, the goals for accomplishing and maintaining its mission, and strategies for achieving these goals from 2001 to 2005. A general overview of the park’s organizational structure, financial resources, available facilities, and evaluation techniques is provided in this document. Fire Island’s mission goals fall under one of the following 4 categories:

- Preserve park resources.
- Provide for visitor experience at the park.
- Strengthen and preserve natural and cultural resources and enhance recreational opportunities.
- Ensure organizational effectiveness.

Within these four categories each specific long-term goal is highlighted in measurable ways. While there are specific goals addressing recreational uses, educational opportunities, and resource improvement, no specific recommendations are proposed.

2001 Air Resource Management Plan

The *Air Resource Management Plan* highlights NPS goals and objectives regarding air quality, noise, artificial light, weather, and climate. This plan proposes an aggressive role for the National Park Service in preserving, protecting, and enhancing the air quality in all park units. The National Park Service aims to preserve the natural quiet and sounds associated with each park. To ensure protection from excessive noise, monitoring programs and necessary actions should be applied to prevent adverse effects to the natural resources and to the visitors at each park. While the plan addresses the need to protect the park’s air quality and noise environment associated with all new and human sources, it contains no specific regulations for beach alteration activities.

OTHER FEDERAL AGENCY PLANS, POLICIES, AND ACTIONS

Environmental Justice

Executive Order 12898 directs federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. Consistent with this mandate, the population in the vicinity of the FIIP is evaluated to determine the potential for the project to adversely affect minority and/or low-income populations. The demographic study area comprises all census tracts wholly or partly on Fire Island.

The census tracts that include Fire Island (excluding the west end of Robert Moses State Park), have a total population is 9,205 with median household incomes of $31,500 and $52,939. The population of the census tracts including Fire Island is overwhelmingly white (from 96.4 to 98.7 percent) with few minorities. The seasonal population during the summer months (on Fire Island only) is estimated at approximately 20,000; the racial composition of seasonal residents is assumed to be similar to that of permanent residents, with no significant concentrations of low-income households or minority populations.

Local and regional businesses, residents, and tourists determine the socioeconomic climate at and near the park, which is located in the most densely populated region of the United States. Although park visitation is high, particularly during summer when several million visitors may visit the park (NPS 1977), the alternatives evaluated in this EA would have a negligible affect on local and regional tourism and would not affect socioeconomic conditions or socially or economically disadvantaged populations.

1972 Coastal Zone Management Act

In recognition of the increasing pressures of over-development on the nation's coastal resources, Congress enacted the Coastal Zone Management Act in 1972. The act encourages states to preserve, protect, develop, and where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. A unique feature of the coastal zone management program is that participation by states is voluntary. To encourage states to participate, the act makes federal financial assistance available to any coastal state or territory that is willing to develop and implement a comprehensive coastal management program. In addition, once a state adopts a plan consistent with the Coastal Zone Management Act, that state's coastal plan agency can make consistency determinations on federal actions subject to the plan.

State coastal zones include the coastal waters and adjacent shorelands that extend inland to the extent necessary to control activities that have a direct, significant impact on coastal waters. For federal approval, a coastal zone management plan must (1) identify the coastal zone boundaries; (2) define the permissible land and water uses within the coastal zone that have a direct and significant impact on the coastal zone and identify the state's legal authority to manage these uses; (3) inventory and designate areas of particular concern; (4) provide a planning process for energy facilities siting; (5) establish a planning process to assess the effects of, and decrease the impacts from, shoreline erosion; and (6) facilitate effective coordination and consultation between regional, state, and local agencies. The National Oceanic and Atmospheric Administration approves coastal zone management plans and oversees subsequent implementation of the programs.

1982 Coastal Barriers Resources Act

Congress passed the Coastal Barriers Resources Act in 1982 to address problems caused by coastal barrier development. The act restricts federal expenditures and financial assistance, including federal flood insurance, in the Coastal Barrier Resource System. This system is made up of a defined list of undeveloped coastal lands and associated aquatic environments that serve as barriers protecting the Atlantic, Gulf, and Great Lakes coasts.

The system currently includes 585 units, which add up to almost 1.3 million acres and about 1,200 shoreline miles. There are also 274 "otherwise protected areas," a category added by the 1990 Coastal Barrier Improvement Act for coastal barriers within lands reserved for conservation purposes. Fire Island is included in this system as an otherwise protected area.

Three important goals of this act are to:

- minimize loss of human life by discouraging development in high risk areas,
- reduce wasteful expenditure of federal resources, and
- protect the natural resources associated with coastal barriers

Federal monies can be spent within the system for certain exempted activities, after consultation with the U.S. Fish and Wildlife Service. Examples of such activities include emergency assistance, military activities for national defense, and maintenance of existing federal navigational channels.

Endangered Species Act

Section 7 if the Endangered Species Act (ESA,16 USC 1531 et seq.) mandates that all federal agencies consider the potential effects of their actions on species listed as threatened or endangered. If the National Park Service determines that an action may adversely affect a federally listed species, consultation with the U.S. Fish and Wildlife Service (FWS) is required to ensure that the action will not jeopardize the species' continued existence or result in the destruction of adverse modification of critical habitat. If it is determined that a proposed federal action is likely to result in the "take" of a listed species, then the FWS may describe those conditions which must be met in order for an activity to proceed. "Take" includes harming or harassing or species in ways which interfere with its normal breeding, feeding, or sheltering behaviors.

Informal consultation was initiated with the FWS and the National Marine Fisheries Service (NMFS) as well as the designated State regulatory agency, NYSDEC, throughout the internal scoping period for this project. Formal consultation under Section 7 of the ESA has also been initiated and a response from the FWS and NMFS will be incorporated into this EA or its errata sheet. Comments and information on species that potentially occur within or adjacent to the project area within the boundaries of Fire Island National Seashore was requested. An analysis of the potential impacts to each species listed is included in this document.

This draft environmental assessment will be submitted to the FWS, NMFS, and NYSDEC for review of ESA compliance along with an associated Biological Assessment which covers the species impacts more thoroughly and which is required for formal consultation with these agencies.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful.

Marine Mammal Protection Act of 1972

The Marine Mammal Protection Act establishes a federal responsibility to conserve marine mammals, with management vested in the Department of Commerce for cetaceans and pinnipeds other than walrus. The Department of the Interior is responsible for all other marine mammals, including sea otter, walrus, polar bear, dugong and manatee. The Act generally assigns identical responsibilities to the Secretaries of the two departments.

STATE AND LOCAL GOVERNMENT PLANS, POLICIES, AND ACTIONS

2001 Long Island South Shore Estuary Reserve Comprehensive Management Plan

The *2001 Long Island South Shore Estuary Reserve Comprehensive Management Plan* was prepared as a result of the Long Island South Shore Estuary Reserve Act. The act was established to address the concern of the future health of the South Shore Estuary. The purpose of the plan is to recommend management actions to protect and restore the health of the estuary. It was developed in coordination with the South Shore Estuary Reserve Council (SSERC), New York State Department of State's (NYS DOS) Division of Coastal Resources, and county and local governments. The plan provides recommendations to improve and maintain water quality; protect and restore living resources of the reserve; expand public use and enjoyment of the estuary; sustain and expand the estuary-related economy; and increase education, outreach, and stewardship. The plan provides the implementation actions, which are strictly voluntary, necessary to achieve the recommendations. Plan recommendations are strictly voluntary; there is currently no legal mandate that they be implemented. However, the SSERC and partners are using the completed plan to request implementation funding. The southern boundary of the SSER is the mean high tide line on the ocean side of Fire Island.

2000 Non-point Source Management Program under 33 USC §§ 1329 (b)(2)(F) and (k)

Congress enacted Section 319 of the Clean Water Act in 1987, establishing a national program to control nonpoint sources of water pollution. The mission of New York's non-point source management program is to control, reduce, or treat polluted runoff through the implementation of structural, operational, or vegetative management practices; to administratively coordinate various state agencies and other interested partners having regulatory, outreach, incentive-based, or funding programs that foster installation of management practices for any of the identified sources of non-point pollution threatening or impairing the waters of New York; and to conduct local implementation and statewide coordination and evaluation on a watershed basis.

New York Coastal Management Program under 16 USC §§ 1456

The New York State Department of State, Division of Coastal Resources reviews projects and activities of federal agencies for consistency with the policies of the New York State coastal management program. The state's program establishes New York's vision for its coast by clearly articulating specific policies on development, fish and wildlife, flooding and erosion hazards, recreation, historic and scenic resources, agricultural lands, energy and ice management, public access, water and air resources, and general policy (NYSDOS 2002). Federal activities (e.g., development projects, permits, and funding) are reviewed by the Division of Coastal Resources to ensure adherence to the state program. Over 800 federal activities are reviewed each year. The Division of Coastal Resources advises agencies on the consistency of their activities with the state or local program.

The consistency provisions of the federal Coastal Zone Management Act of 1972 require federal activities to be consistent with the state's federally approved coastal management program. This requirement applies to all federal activities and federally authorized activities within, as well as activities outside, the state's coastal zone that affect the zone. Applicants for federal agency approvals or authorizations are required to submit copies of federal applications to the New York State Department of State, together with a Federal Consistency Assessment Form and consistency certification, so that the state can review the consistency certification and proposal for consistency with the coastal management program. Applicants for federal funding must submit an identification of the proposed funding source and a description of the project. If the Department of State determines that the proposed activity would be inconsistent with the state's coastal management program, federal agencies may not fund or approve the proposal. Direct activities by federal agencies are subject to similar requirements.

1998 New York Clean Water Action Plan

The federal Clean Water Action Plan requires each state to prepare a unified watershed assessment to determine where additional funding will help achieve "fishable and swimmable" waters for all Americans. On October 1, 1998, New York submitted to the Environmental Protection Agency an assessment bringing together water quality and natural resource factors in each of the state's 54 watersheds. Based on the state's unified watershed assessment, the state established restoration priorities for those watersheds that did not meet clean water or natural resource goals.

New York Water Quality Standards

The New York State water quality standards (6 NYCRR Part 703) provide standards, guidance values, and/or groundwater effluent limitations, including all (total) forms of a substance, unless indicated otherwise. Where a standard or guidance value is for a specific form of the substance, water quality based effluent limitations for permits may include other forms of the substance to account for changes in the substance that occur in the receiving water. Part 703.5 lists water quality standards for toxic and other deleterious substances.

New York State Implementation Plan under 40 CFR Part 51

No department, agency or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve any activity which does not conform to an applicable implementation plan. A state implementation plan is a state proposal on how to reduce air pollution to levels that are below the national ambient air quality standards within the state. These plans are approved by the U.S. Environmental Protection Agency and include the following information: (1) descriptions of current emission control programs, (2) future programs, (3) an inventory of emission sources, including stationary sources (as an example, factories) and mobile sources (on-road and off-road cars and trucks), (4) modeling demonstrations used to predict future air quality, and (5) rate-of-progress determinations that show how emissions will decrease over set periods of time. The New York State Department of Environmental Conservation, Air Resources Division, is responsible for drafting and implementing the implementation plan.

The attached Record of Non-applicability, Appendix 1, demonstrates compliance with this section of the Clean Air Act and the State of New York Implementation Plan.

New York State Coastal Erosion Hazard Areas Act

Due to the erosion-prone nature of parts of the New York coastline, the Coastal Erosion Hazard Areas Act (CEHA) (Article 34 of the Environmental Conservation Law) regulates construction in areas where buildings and structures could be damaged by erosion and flooding. 6 NYCRR Part 505 provides procedural requirements for development, new construction, and erosion protection of structures. The New York State Department of Environmental Conservation (NYSDEC) enforces the regulations if the city and county do not provide coastal hazard regulations. New York State has identified the entire Atlantic Ocean shoreline of Fire Island as a coastal erosion hazard area. New construction is not permitted on the primary dune in these areas but is permitted on the secondary dune. As is discussed below, any projects which would cause a primary dune to then qualify as a secondary dune under the CEHA, would not be permitted by the NPS without a more thorough NEPA review and other evaluations. Pre-existing development is strictly limited to only a 25 percent increase in ground coverage area. The CEHA prohibits motor vehicle use on vegetation and landward of the debris lines.

State law provides for the NYSDEC to revoke certification of local CEHA management programs if local administration is not consistent with statewide minimum standards, and to assert regulatory jurisdiction over these areas.

New York State Public Lands Sand and Gravel Resources Law

New York State Public Lands Laws, Article 2, Section 22, provides that the Commissioner of General Services is authorized to manage, license, and regulate the removal of sand and gravel by dredging or otherwise from underwater lands. Fees may be charged for the license to remove such sand and gravel. This law specifically excludes authorizing taking of sand and gravel from waters bordering Long Island from the Commissioner's authority. This law does not apply to projects which are found by the United States Corps of Engineers to be necessary for the improvement of navigation, which would not appear to be applicable to this project.

Endangered and Threatened Species of Fish and Wildlife; Species of Special Concern

According to Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 182--Endangered and Threatened Species of Fish and Wildlife; Species of Special Concern, all parties must avoid disrupting the state-listed threatened and endangered species that may occur in the project area and related borrow area. Part 182.6 lists all species in New York State that are listed as endangered threatened, or species of special concern. These species are addressed under the special status species section in this EA.

ISSUES AND IMPACT TOPICS

This environmental assessment is prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, regulations of the Council on Environmental Quality, 40 CFR 1508.9, and the National Park Service's NEPA guidelines, Director's Order 12. The assessment evaluates 4 alternatives to meet the FIIS management objectives allowing private property storm protection efforts while protecting natural and cultural resources and values and providing recreational opportunities and access on Fire Island. Analysis of the alternatives focuses on the impact that beach stabilization/ replenishment may have on natural and cultural resources and values of Fire Island National Seashore, as well as its effect on the visitor experience and park operations. The purpose of this EA is to evaluate these alternatives in an effort to simplify the Special Use Permitting Authority under DO 53, for the projects that are anticipated to be proposed and funded by the communities located within Fire Island National Seashore (FIIS).

This EA is written in recognition of certain facts discussed above:

- the statutory purpose in creating the Fire Island National Seashore was to conserve and preserve the beaches, dunes and other natural features,
- that the rates of ocean shoreline change and retreat observed in the Seashore appear to be consistent with levels of sea-level rise,

- that the communities within the Seashore naturally receive about twice the volume of sand as those in areas east to the Hamptons,
- that the artificial fill projects conducted by various human efforts over the past fifty years have endured only for a marginal time,
- that barrier islands function through a process of retreat and roll-over so erosion of the beachfront is an expected and predictable process while the configuration and location of coastal landforms are inherently unstable and unpredictable,
- that the continuous cyclical process of erosion and accretion corresponds more with periods of storm activity than with human actions, although human actions can interfere with accretion processes, if the sand-anchoring dune grass is sheared, covered or disturbed.

The longer term goals of FIIS is to allow natural dunes to develop through growth of healthy webs of dunegrass rhizomes, sufficiently north of the beachface, so that they are not scoured by smaller periodic storms. Over time the dunes and beachface have been and are affected by houses and other structures which are interfering with dune development. It is for the FIMP to determine how best to achieve that long-term goal. The interim actions considered here are designed to examine what actions will not hamper the ability of the federal agencies to achieve those goals, while recognizing that either physical manipulations or regulatory processes which would foreclose implementation of the longer term goals are beyond the scope of projects which can be implemented through an EA, as they would then be ones which would have a significant effect on the environment and require preparation of an EIS.

The spectrum of natural and cultural resource impact topics that will be considered for further discussion and analysis are addressed in detail under the Affected Environment Section. Special focus is placed on shoreline and beach resources, as they are likely to be most impacted by any of the potential alternatives and are under NPS management.

The primary and controversial issue is how to allow communities to protect their private property within NPS boundaries and mission, without impairing NPS resources, policies and operations. Numerous NPS and other laws and policy provide a framework and guidance for both protection of the FIIS natural resources and private property within FIIS boundaries (see related laws, policies, plans, etc. sections above). Unfortunately, applying that host of guidance documents to individual permit requests and projects at the ground level continues to be a challenge in balancing the needs of both the natural and human resources of the area. Although NPS guidance clearly states that private homes may be constructed within the park, it also recognizes that such development should be compatible with park resources and allow for public access and use. NPS GMP guidance further recommends that communities pay for their own improvements without public expenditure.

NPS seeks to restore a more effective, natural and self-sustaining dune system and natural barrier island ecosystem. It is now well understood and documented in both scientific literature as well as under national and state laws, that a natural barrier island system is a dynamic resource that not only remains in a constant state of flux, but also provides unique habitat to a diverse, threatened, and protected ecosystem. The use of any beach nourishment or stabilization techniques must go hand-in-hand with enforcement of existing regulations for protecting this dynamic collection of resources. The National Park Service, in developing the EA, is attempting to provide scientific documentation that would support limited Special Use Permitting for the projects that are developed below to prevent substantial impairment of the natural systems on Fire Island.

Relation to other Plans, Policies and Actions

Another major issue deals with scale, relativity, and consistency, both spatially and temporally, in relation to other existing or planned projects. FIIS seeks to meet the needs of communities in the next few years before the Reformulation Plan is approved, at the same time as protecting park resources in the short and long term. Under the provisions designating and governing Fire Island's creation as a national seashore, adopted in 1964, contained at 16 U.S.C. §§ 459e, there is a requirement for a mutually acceptable project under the Reformulation Plan, Fire Island to Montauk Point. The Fire Island National Seashore Act states:
"the authority of the Chief of Engineers, Department of the Army, to undertake or contribute to shore erosion control or beach protection measures on lands within the Fire Island National Seashore shall be exercised in accordance with a plan that is mutually acceptable to the Secretary of the Interior and the Secretary of the Army and that is consistent with the purposes of this act."

The principal role of the NPS is to assist the USACE in developing and evaluating alternatives that protect the natural environments and are consistent with the mission of the NPS and Fire Island National Seashore. Specifically, FIIS is focused on the management and protection of the Fire Island National Seashore, which falls within a portion of the study area. An Interagency Reformulation Group meets regularly to review the status of the project.

However the National Park Service must evaluate this short-term project within the context of consistency, recognizing the longer- term Reformulation Plan development as well as the Draft Interim Project that was not implemented due to a wide range of concerns. The nearby Shinnecock Inlet project also provides some comparison and perspective and is therefore referred to in this document.

Consistent with its statutory mission and partnership with the Army Corps of Engineers in participating in the Fire Island to Montauk Point Reformulation Plan (FIMP), the National Park Service (NPS) seeks to restore the primary dune system along the length of the National Seashore to a more natural condition and location to function as a natural, self-maintaining protective feature for the shore communities. The intent of this document is that actions permitted to occur will not conflict with or preclude consideration of alternatives for the FIMP. The goal is to establish an NPS permit system for beach stabilization with criteria that are more compatible with the long-term goal of reestablishment of the natural dune system's integrity and function.

The Department of Interior (DOI) requires that all work within the FIIS be consistent with all NPS laws and policies, which include prohibitions on work in major federal tracts and no southward realignment of the dunes which would prejudice the ultimate NPS alternative of removing dune-front construction and restoring natural dune functioning in their natural location. Specifically, DOI's positions on beach replenishment proposals state the following issues and concerns with which this document must conform.

DOI seeks a natural, healthy dune system as the primary and best system to protect the homes on Fire Island and the properties on the South Shore of Long Island. It supports any method to achieve such a system and a plan that protects natural resources and endangered species habitat and is compatible with NPS laws, regulations, and policies.

In any proposed project, DOI seeks consideration of alternatives that include instituting a program to restore a dune system that functions more naturally:

- Full implementation of a complimentary Federal/State dune protection regulation system that achieves this end;

- A designated dune line (no building zone) that once designated will not be moved seaward regardless of either natural or artificial sand placement;

- A program that supports the prohibition of building in the federal dune district;

- Immediate approval of New York State Article 34 implementation of a Coastal Hazard Protection Zone that overlays existing conditions, not conditions after sand replenishment.

DOI seeks the use of multiple means to maintain the dune and beach in a natural condition including tenancy, lot trade, transfer, purchase and condemnation options. DOI wants to see in any proposed project, a plan that includes improved public access and use of the beach, as well as eventual removal of the Ocean Beach groins.

DOI seeks to use Article 34 coastal zone hazard line as the control line, as it is compatible with the State, and alleviates resident fears of NPS unilaterally controlling this zone’s position.

Since 1996 DOI has supported a one-time dump of sand outside of the main federal holdings as long as it would not preclude implementation of other long-term approaches to dune protection. DOI recognizes that community funded projects may provide some interim protection to the island communities under exigent circumstances until the FIMP is approved.

DOI supports the Reformulation Study for long-term solutions. Approval of the one-time dump is contingent upon the Reformulation Study being done immediately. DOI continues to support the Breach Contingency Plan (BCP) as now written in which the NPS is the primary protector of the Seashore. The BCP only allows for the interim closure of a breach, not for dune construction.

The scope of this EA differs significantly from the ACOE Draft Interim Plan (FIIP) in both spatial and temporal scales, although it is also short-term in nature. The short-term scope and project location (restricted to community and private property flanked beaches) restrict these activities to a maximum of 6 miles, that is if all communities chose to apply for and exercise the FIIS permit, and if a permit is granted. More realistically we anticipate that there will be about 5 community renourishment projects and up to 17 communities requesting beach scraping within the two and one half (2-1/2) year period. We are restricting this EA to covering only 2.5 years to ensure that if the FIMP is not completed, a new EA process can be undertaken by the National Park Service to cover this same suite of project actions utilizing data gathered on projects conducted between now and then.

Concomitantly, the use of vehicles on FIIS is being studied under a separate negotiated rule-making process.

ALTERNATIVES

This section describes the alternatives that have been considered in the overall project analysis to meet the desired NPS objective of providing for compatible private property storm protection while protecting natural and cultural resources and values and recreational access to the park. These alternatives arrived through scoping with an Interdisciplinary Team (IDT) and stakeholder meetings a well as follow up discussion with the IDT and NPS staff. Possible solutions considered in the initial scoping process with both agency and community representatives are listed below.

Certain alternatives were eliminated early in the analysis because they did not sufficiently meet project goals. Specifically, certain long-term hard structural alternatives were screened out because they did not meet regulations governing the Fire Island Nations Seashore. Other alternatives, which offered little emergency protection, were screened out because they did not meet the community's storm protection objectives. Only those alternatives determined to have any potential for meeting the objectives of providing short-term protection against storm damages, were considered for further evaluation. The alternatives, discussed briefly here, are broken down later in this report for clearer and further analysis. A, B, C, and D the main focus of this report, are discussed in depth in following sections. E through G were grouped into one hard-structure alternative. Sandbags were considered an Emergency activity, outside the scope of this EA, and I-L were grouped as a single non-structural alternative.

A. No action
B. Beach scraping
C. Beach nourishment/dredging and associated borrow/fill
D. Beach Scrapping/Beach Nourishment (Combination of B & C)
E. Groin construction/removal and notching
F. Concrete breakwaters/bulkheads, seawalls
G. Geotubes
H. Sandbags
I. Acquisition
J. Removal and relocation
K. Floodproofing/retrofit
L. Zoning

Alternative A. No Action.

No beach stabilization/nourishment activities will be permitted by NPS to allow communities to protect their private property through 2005 or until approval of the Reformulation Plan.

This alternative means that no community beach stabilization or renourishment efforts would be permitted by the NPS before the approval of the Reformulation Plan. Under this scenario, shoreline changes and storm damage would continue without implementation of protective or restorative measures. Only emergency measures, such as the Breach Contingency Plan (BCP) (USACE 1995) would provide for storm damage protection of the barrier island until the Reformulation Plan takes effect. This means that in the event of a breach, the BCP could provide for immediate (within 3 months) fill of the breach to a height of nine and-a-half feet.

Until the results of the reformulation Plan are available and better alternatives are developed, some beach nourishment may be required. This alternative would not meet the short-term needs of the communities for storm and flood protection. There is the perception that without some project there would be an increased risk of storm damage to homes and infrastructures in each community until either emergency measures or the BCP were implemented. A no-fill action could result in the inability of emergency vehicles to travel along sections of beach in the project area during high tide, thus potentially affecting emergency response. The damage value of affected Fire Island structures could exceed $640 million (USACE 1999 FIIP). The costs of any breach or the effects that it would have are difficult to predict. If, as predicted, the bulk of sand anticipated being placed on the beach washes away within the next four years, this cost would be saved if the projects were not allowed to be undertaken. Since the funds being expended here are private and not public funds, the NPS is not addressing this expenditure aspect. Whether or not houses would be lost cannot be reliably predicted if no project were to be permitted and allowed to proceed.

On the other hand, if no project were implemented, natural processes would occur without additional human manipulation. Onshore transport of sediment would occur which would contribute to island height. Overwashes and breaches allow cross island movement of sand which serves as a substrate for marsh growth and ephemeral overwash species habitat, as well as contributing to bayside accretion.

The existing structures, especially those on the beachface, are located in a hazardous area. If no project were conducted, it could reinforce to the landowners the risks of their current situation, encouraging them over the long term, to exercise other options before a major storm event.

Considering the amount of development, both commercial and residential, along the ocean front and bay side of the barrier and all of the affected properties on the mainland, the potential result of no action is socioeconomically controversial. While this alternative was not considered as the preferred alternative for that reason, it does provide the basis against which the project benefits are measured.

While, the No Action Alternative is not strictly "no-action", since the BCP or USACOE Emergency Action Authority may result in beach nourishment action, there are no guarantees that these actions would be forthcoming in a timeframe needed to minimize damage to communities. Further, the No Action Alternative could be seen to allow natural processes to occur in the face of human-caused dune impacts and beach-front construction. The significance of breach and overwash created habitats to Federally and State listed endangered species, such as in the Westhampton Interim Project Area, is uncertain as implementation of the BCP and other Emergency Action measures could result in positive or negative impacts to these species, and breaches through the middle of a community, would create a population sink that would outweigh any positive benefits.

Alternative B. Beach Scraping.

This alternative considers those activities that mechanically manipulate the beach or redistribute sand within the existing sand budget. This includes what is normally considered by state permitting agencies as routine beach maintenance or regrading activities (NYSDEC-6NYCRR Part 661), (NJDEP- NJAC 7:13, Subchapter A), (NC-15NCAC 07H Ocean Hazard Categories). It is considered as routine beach regrading and cleaning by NYSDEC as a "Presumably Incompatible Use" under NYSDEC Tidal Wetland Land Use Regulations 6 NYCRR Part 661 for which a permit is required.

Beach Scraping is the most commonly used beach maintenance technique used by communities within the boundary of Fire Island NS. Beach scraping (sand harvesting) has occurred within numerous Fire Island Communities since 1993. NYSDEC issued permits on an experimental basis and has renewed them for the maximum duration of 10 years. Most scraping permits will expire in July 2003 (Carrara, pers. comm. Meeting 02/03) with only one or two permits valid through 2004. Data have been collected per special conditions as outlined within NYSDEC Article 25 permits. These permits have required that a community or "reach" incorporate a minimum of 100' of beach width over elevation 7' (NGVD) in order for scraping to occur. Severely eroded beach/dune systems have therefore not been candidates for scraping programs.

Considerable discussion with community representatives and regulatory agencies alike has raised the question of the effectiveness of beach scraping for storm damage protection. Unfortunately, beach profile data associated with approved permits have not been analyzed and this question has not been answered from a technical coastal process standpoint. However, from a community resident standpoint, effectiveness was determined a success when even one house was saved from storm damage from a beach scraping project. It appears to be a consensus viewpoint from both agency scoping and community meetings and data assembled to date, that beach scraping is utilized as an immediate and short-term "maintenance" tool to repair storm damaged dune systems where beach widths are adequate to provide the sand for redistribution.

Beach scraping could be considered within the communities for maintenance under NPS special use permit within the following framework. This framework is a result of incorporating input from regulatory agencies, community representatives and stakeholders that provided input and concerns throughout the process. The framework utilizes existing guidelines, whenever available and appropriate, *i.e.* base flood elevations from the Flood Insurance Rate Maps from the National Flood Insurance Program and FEMA, ACOE NY District, NY and NJ DEP data and modeling results and engineering design data, NYSDEC wetland regulations, USFWS and NMFS (Threatened and Endangered (T&E) species and Essential Fish Habitat (EFH)) information. This table is an attempt to provide guidance criteria for NPS to utilize in the special use permit evaluation process for short-term storm damage communities protection projects. Specifically it lists threshold criteria that frame the conditions under which NPS would consider issuing a special use permit for beach maintenance activities.

In order to maintain consistency with the 1977 GMP, communities would bear the financial costs of the projects. To maintain consistency with NPS non-impairment requirement and the DOI position on beach replenishment, no tapers would be allowed on NPS lands, and no southward placement of the dune would be permitted.

If the project would enable the current primary dune to then qualify as a secondary dune, then a permit could not be issued without adequate local zoning or DEC regulations to ensure that development is not increased as a consequence of the projects. Beach profile data are consistent with NYSDEC (NYSDEC permits 1993-2003), NJDEP (NJDEP 2000) modeling and monitoring data (Psuty and Piccola 1991, Psuty and Tsai 1997). The croteria are derived from discussions with coastal processes experts, planners, and policy makers to provide the most effective protection for natural beach and dunes. Seasonal restrictions are derived from and consistent with USFWS criteria for T and E species Recovery Plan and Consultation guidance to avoid, minimize and mitigate take (USFWS, letter dated 2/14/03, USFWS 1996 and 2002).

Table 1. Potential Criteria for Beach Scraping.

Process and responsible party	NPS land/ impact	Seasonal restrictions	Monitoring	Scope/ level	Project design criteria
Communities must apply for all appropriate permits and funding must be private, with no public expenditures (NPS 1977) Applicant/permitee is responsible for implementing and enforcing all criteria and conservation measures as part of project design and permit conditions	Not on NPS upland, except for small lots within community boundaries Equipment transport will occur by water or interior road transport to avoid and minimize impacts to additional areas of the shoreline whenever possible	March 1- November 1 Combined safety window Derived from: 3/1-9/1 FIIS beach Threatened and Endangered (T&E) species protection 4/1- 9/1 USFWS Plover window 4/1-11/1 USFWS Amaranth window Allowed after July 15- through Sept. 30 if surveys and monitoring (conservation measures per USFWS protocol) determine no plover nests w/in 1000m	Shoreline and ecological resources including T&E species presence, pre-project, during, and post project-project life USFWS and NYSDEC protocol will be used and are included as part of the project requirements	Potential for max of 12-17 projects within 2.5 years Each project minimum length 500' (C/B ratio)	1) Minimum Beach width 100' @ 9.0' NGVD to be considered 2) only 1' of beach is permitted to be scraped - dozer blade restriction 3) dune face slope = 1/4 4) maximum beach construction will allow a maximum of 1:4 slope dune up to a 30' dune crest @ 16.5' NGVD, 1:4 dune slope down to 9.0' NGVD, 100' of beach @ 9.0' NGVD 5) Constructed dune template must be built over existing dune. 6) vegetation preserved or planted with local genetic stock at varying densities (per USFWS protocol) 7) all debris removed or reused (fencing) 8) No southward dune placement accept where widening dune crest per NPS developed template 9) project will meet all USFWS, NMFS and NJDEP T & E species conservation design measures.

		each direction and no SB Amaranth w/in 100m each direction			

Costs/benefit

Beach scraping costs range widely by the project, but average $25,000 for a minimum of 500' beach length (FIA, Bowman, pers. comm. meeting 1/03). It is the least costly property protection/beach restoration method permitted and used by the communities. A scraping project is considered a benefit/success, according to the community representatives, when a project is able to protect a single house from a single storm. Beach scraping is used and recognized as an affordable, temporary solution that only brings short-term relief to property owners who cannot financially afford to conduct more expensive beach renourishment (of 100 times the cost, usually in excess of a few million dollars). Local Erosion Control Districts are established, which levy/raise district taxes to pay for each scraping project. The communities and affected residents are therefore paying for their own protection activities without state or federal funding.

A major adverse effect from beach scraping involving any use of heavy equipment within 20 feet of the rhizomes of any existing beach grasses is that they will be sheared by the heavy equipment operating in the area. Scientific analysis has uncovered that rhizomes can be sheared with a single pass of an off-road vehicle, and all rhizomes were sheared after five passes (Leatherman and Allen, 1985). Furthermore, the burial of existing vegetation under sufficient sand to prevent existing grasses from growing upward will retard the development of a web of rhizomes which would hold accreting sand in place. Rhizomes have developed through three vertical feet of sand, but some of the proposals probably will entail creating sand piles significantly higher than that (Allen, personal communication). Beach grass planted on top of an artificially created mound of sand, while more effective at trapping the sand than nothing, is ineffective under serious storm conditions because it does not rest upon a web of rhizomes creating a structure through the dune. The impacts of beach scraping should be studied more fully as some coastal experts have indicated that the effects are, at best, neutral (Allen, personal communication).

Historical/Existing Permit Conditions

Presently DEC requires a 100' beach width, and a 7' beach height above NGVD maintained. A minimum length of 500 feet has been considered cost effective. Although permits have been issued for scraping between April 30-August 15 (2 per season), it is most frequently conducted between June and August during heavy recreational dates and when sand is present to be harvested after seasonal build up cycles. Snow fencing, in a zig-zag pattern at the toe of the dune accompanied by grass plantings to stabilize the dunes are required in the fall.

Beach scraping is not a commonly used technique along the Atlantic coast, but has been used in NC and NJ under different, limited conditions. In these other states, the scope of beach scraping has been limited to the fall, winter or very early spring (excluding the April - August window) to minimize disturbance during the growing/breeding season, but still allowing a window of scraping during the beach build up stage when the sand is most available and can be most efficiently harvested. Dune height and beach profile are encouraged to be restored to the most natural dune system profile. Sand fencing and grass planting activities are allowed under certain conditions (NJ AC 7:13, Subchapter A, NC-15NCAC 07H Ocean Hazard Categories).

Under this alternative, beach scraping would be considered if the applicant met the following criteria. Each applicant can apply for one stabilization/nourishment project during the scope of this project.

- All necessary local, state and federal permits and approval secured. This will include Section 7 Consultation for Threatened and Endangered species for each project with the US Fish and Wildlife Service.

- The beach/dune profile and design parameters were met and the threshold for need was established.

- No dis-placement of the foredune will be allowed seaward of the existing dune crestline. The full template is measured from the inland toe of the foredune.

- Dune template to be constructed will allow a dune with a 30 foot wide crest at 16.5 NGVD. This 30 feet will be measured 15' seaward and landward of the existing dune crestline – OR – where no dune is present, the dune crestline will be located by following the trend of the adjacent (east and west) dune crestlines. All constructed dune crestlines must be flat or rounded upward (convex) with no downward swales along the crest. The inland slope of 1:4 will extend to the position of the natural grade.

- In those locations where houses are on or seaward of the dune crest, the dune crest will follow the same dimensional standards and no dune crest wider than 30 feet will be allowed.

- This dune must be constructed over the existing dune area at the time of the application. Data to be used by NPS for determining the existing dune position will be one of the following: 2000 LIDAR data; 2002 LIDAR data once available; data supplied by an applicant that presents survey information developed on or after the year 2000 and is agreed upon by the NPS.

- All debris from past projects/activities is removed as part of the application and pre construction monitoring indicates that no protected beach species are present.

Interpretive and Education component is implemented--signs and community involvement. This includes:

- Symbolic fencing to protect the recently established dune and provide for wildlife habitat.

- Applicant will be required to monitor (or pay the cost of monitoring) the beach profile as well as pre- and post-project biological monitoring of beach flora and fauna with protocols developed by the NPS.

- Native species (and genetic stock) dune grasses are used instead of non-native species or stock.

Alternative C. Beach Nourishment

Borrow/fill +Associated activities-dune crossing, fencing, planting
Beach nourishment involves placement of sand directly on an eroding shoreline to restore its form and subsequently maintain an adequate beach width. This option would include a berm backed by a dune to reduce the storm damage potential to structures on the dunes of the barrier island. It is regarded as the most environmentally compatible means of shoreline engineering as compared to hard structure alternatives, since this technique can mimic the natural process of sand addition to the barrier chain (Leatherman 1982). Introduction of new sand, obtained from sources outside the nearshore sand-sharing system, provides the material for adjustment of the beach and shoreface according to the energy conditions and sea level position. The principal effect of beach nourishment would be the delay in advent of the natural geomorphic processes involved in landward barrier migration. Beach nourishment will also tend to revert to near pre-project conditions over time, depending upon varying weather and island hydrogeomorphological dynamics. In this case the allowable beach nourishment projects will not build a dune system that is any further south of the existing dune. In the case of structures being present then the dune may be allowed to be widened enough that the dune crest would extend underneath the existing structure, depending on conditions at the time of the permit application and data available for analyzing the historical location of the dune. However, no downward dips on the dune crest will be permitted so that the fill material could be considered a new primary dune. If the fill cannot be tied into the dune crest, then beach fill may still be utilized, but no elevation above those existing beneath the structure will be permitted.

Historical Context

Beach renourishment has occurred on Fire Island historically in the last 50 years. Between 1955 and 1994, approximately 6.4 million cubic yards of fill were placed on Fire Island by the federal government, local municipalities, and local interests. Approximately 54% of this fill activity occurred during the 1960's in response to the severe shoreline change caused by Hurricane Donna (1960) and the Ash Wednesday storm of 1962. Some 1.66 million cubic yards of fill was placed on Fire Island's beaches more recently, between 1993 and 1997. Most of this latter fill was placed by local communities at Fire Island Pines, Ocean Bay Park, Fair Harbor, and Saltaire in response to the severe storms that occurred during the early 1990's.

The recent projects and most current applications for projects provide information on the range for potential projects. Two current project applications for renourishment of 8,800 and 7,300 linear feet of beachfront, covering a total of approximately 175 acres of beach and submerged land, are proposed to construct a beach elevation of 9.5' NVGD and a dune elevation of 15'. These two projects were designed to place a total of 1.2 million cubic yards of sand on the beach. They would be conducted during the fall/ winter dates of past projects so as to minimize disturbance to natural resources. The approved ACOE borrow area off shore with similar sediment size and composition would be used as the sand source. This site is typically referred to as the Army Corps of Engineers Borrow Area 2. 1996 surveys of this borrow identified a total of 17.7 million cubic yards of compatible sand at the site. 1997 projects utilized 1.66 million cubic yards of sand from the borrow. According to these quantities then there are approximately 16 million yards remaining at the site.

The beach nourishment design for ACOE typically involves the construction of a minimum design 25-foot-wide dune with a design crest elevation of +15.0' NGVD with side slopes of 1 vertical foot for every 5.0 horizontal feet (1(v): 5(h)); a minimum design 90-foot-wide beach berm at a design elevation of +9.5' NGVD with a nearshore slope of 1(v):15(h) to a design elevation of -6.0 feet NGVD; and an offshore slope of 1(v):40(h). The design fill has been fronted by approximately 60 feet of advance fill to account for loss of sand over the 2-year period after renourishment. The placement area design fill tends to blend with the existing topography and produce a consistent dune elevation of approximately +15.0' NGVD.

Utilizing the expertise of Dr. Norbert Psuty and the available 2000 LIDAR (Light Detection and Ranging) data, beach profiles were developed throughout the central portion of Fire Island in both communities and NPS land. Analyses of these data determined the averages for dune, beach heights and profiles. This data analysis is being used to develop the recommended profiles for beach nourishment and scraping projects. Along with the ACOE profiles, Dr. Psuty's expertise and the LIDAR data, the beach profiles represent average profiles for beach widths and slopes. Utilizing these data the National Park Service is recommending that constructed dunes and beaches be designed using the following criteria.

Slope from existing island grade, landward of the landward dune toe, 1:4 to a height of 16.5 feet NGVD. If the landward toe was at 9.0' NGVD this would allow 30 feet horizontal;

30 feet at 16.5 feet NGVD for the dune crest;

Slope 1:4 seaward of the dune crest to the beach berm @ 9.0 feet NGVD, an additional 30 feet horizontal;

100 feet of beach berm at 9.0 NGVD;

Slope 1:15 to 0 NGVD, or a total of 135 feet horizontal.

This template will then allow a total horizontal distance of:

30 feet up + 30 feet at crest + 30 feet down + 100 feet of beach + 135 feet of slope = 325 feet of beach dune and slopes from the landward margin of the dune toe at 9.0 feet NGVD to the 0 feet NGVD waterline.

Cost/benefit

Since renourishment mobilization/demobilization costs alone average $1 million, renourishment is most frequently limited by environmental and socioeconomic constraints. Under the existing scenario, less than one quarter of the communities are expected to apply for renourishment, as many have stated that it would likely be out of the scope of their financial feasibility (FIA, 2003).

Currently there are no clear cut guidelines for when renourishment should be considered. However, Rahoy and Bocamazo (2002) list criteria used in the decision-making process to renourish during major ACOE projects. Generally, it is used when damage to man-made structures is deemed imminent and when the communities request such action. NJDEP guidelines suggest that a wider beach and a higher dune with a more gentle slope create the most stable, storm protection conditions (Allen and Psuty 2002). Further studies by Piccola and Psuty on Long Island demonstrate these beach parameters and their effectiveness and response to storm events (Piccola and Psuty, 1991).

A major adverse effect from building new dunes involving any use of heavy equipment within 20 feet of the rhizomes of any existing beach grasses is that they will be sheared by the heavy equipment operating in the area. Scientific analysis has uncovered that rhizomes can be sheared with a single pass of an off-road vehicle, and all rhizomes were sheared after five passes (Leatherman and Allen, 1985). Furthermore, the burial of existing vegetation under sufficient sand to prevent existing grasses from growing upward will retard the development of a web of rhizomes which would hold accreting sand in place. Rhizomes have developed through three vertical feet of sand, but some of the proposals probably will entail creating sand piles significantly higher than that (Allen, personal communication). Beach grass planted on top of an artificially created mound of sand, while more effective at trapping the sand than nothing, is ineffective under serious storm conditions because it does not rest upon a web of rhizomes creating a structure through the dune.

Another possible environmental impact of the addition of a wide expanse of created beach is that it may attract piping plovers and nesting terns. Up to this time, there have been early season sightings of these species in front of the two areas which have already applied for permits. A pair has nested within a mile on each side of the Fire Island Pines, in front of Cherry Grove and in the Talisman Area. There have also been pairs exhibiting mating behavior near Kismet in front of the Fire Island Lighthouse. The population of piping plovers within FIIS has been increasing each year. Early season symbolic fencing will be required to protect the potential habitat formed by the renourishment projects, with monitoring to observe bird behavior. If any pairs nest, assuming that the beach is wide enough for buffer zones to allow continued travel by vehicle, permitted off-road vehicle travel may continue until the chicks hatch. At that point, all travel would need to be rerouted internally until the chicks have fledged, about a month after hatching.

Renourishment in the Intertidal Zone

Renourishment projects have taken many forms along the Atlantic coast. Recent projects such as Baltimore ACOE Ocean City Inlet/Assateague Island have been viewed as more environmentally friendly as they seek to simulate the more natural dune system and overwash features characteristic of natural barrier island systems. (ACOE, 1996. Ocean City, MD and Vicinity Water Resources Study, Immediate Restoration of Assateague Island., 44pp. Under this scenario, more natural "embryonic" dune and beach profiles were established to simulate natural beach profile, shoreline processes and overwash dynamics. This system is being maintained by fill being placed within the nearshore currents/littoral zone to be dispersed and deposited by longshore currents to build up the beach by more natural means.

The objective of the Assateague project is to restore a antural system altered by human influences and not to provide storm damage protection for structures. It was designed to meet an entirely different set of objectives. It is included here as an example of a project that is more consistent with DOI position on beach nourishment which involves the restoration of a natural system.

However, the nourishment technique does merit further evaluation for its applicability to Fire Island. In 1997, the community of Fire Island Pines renourished the beach with approximately 1.5 million cubic yards of sand. At Cherry Grove, the next community to the west and downdrift of Fire Island Pines, the beaches have widened and importantly, the dune formations appear to have increased, to the extent that some properties previously located on the primary dune may now be considered to be on the secondary dune. Cherry Grove has not engaged in any beach scrapping activities. The dunes fronting this community are well vegetated and appear to have increased seaward. Until the 2002 LIDAR data is analyzed, the extent of the change has only been from visual observations. Some of the localized accretion may be due to an absence of the periodic “break in the bar” which causes focused localized erosion at random places along the beach. However, since the source of the sand has only been from intertidal sources, the health of the dune grass and the absence of heavy equipment operating in the rhizome area reinforce the value of considering a renourishment program which includes littoral zone deposition combined with stringent adherence to vehicular passage over the rhizomes.

Sand Source Alternatives

Beach fill material for any proposed project would be hydraulically dredged from the approved ACOE Atlantic Ocean offshore borrow area number two located offshore of Cherry Grove. Hydraulic cutterhead dredges connected to pipelines which deliver the sand on the shoreline will be used. For projects that are further away from the borrow area, such as Davis Park, a hopper dredge may be the dredge of choice since it allows the dredge to travel to the shoreline area where it will then dump the sand. The offshore borrow area number two is the source of nourishment material for all projects. The offshore borrow area would be dredged to obtain beach fill to a depth not to exceed 10 feet below the existing bathymetry as indicated by a pre-dredge survey. Sediment suitability analyses conducted in 1983 and 1996 indicated that the grain size and texture of the material at the offshore borrow area are compatible with the sand at the proposed placement area. The 1996 survey estimated the amount of suitable material to be 17.7 million cubic yards at that time. Taking into account beach nourishment projects performed in 1997, there are now approximately 16 million cubic yards of sand available at this borrow site. If the currently proposed project use 1.2 million yards of compatible sand then that would leave approximately 14.8 million cubic yards of sand for future projects.

Other methods of providing the necessary fill materials were investigated, but were not found to be able to supply the required quality or volume of material. The potential environmental effects in order to bring this volume of sand by land of intensive heavy equipment traffic (on the beach) are considered unacceptable. The use of an upland fill source would call for double handling of the sand and transportation by truck haul for a significant distance (approximately 6 miles). This level of truck transport would result in minimal volume of sand and increased construction and vehicular activity and related beach disturbance. Sand fill transported from an upland source is not a feasible alternative due to high cost and the increased negative impact trucks and heavy equipment have on the beach. The cost associated with trucking sand from Democrat Point stockpile is approximately $800,000 for mobilization plus $2/cy, $4/cy and $7/cy to transport to various locations in the project area (Reiter, pers.comm., Bowman 2002). In addition, the stockpile was established for emergency use in the event of a breach, not for preventive purposes.

Sand bypassing or back-passing are considered as other beach renourishment techniques that involve the placement of material that is currently trapped within an inlet system to areas on the downdrift or updrift sides respectively, thereby reintroducing material into the littoral system to offset the impacts of the inlet as a sediment trap.

At Moriches Inlet, sand that accumulates in the navigation channel is routinely placed on the downdrift shoreline when it is removed for maintenance of the Moriches Inlet Navigation Project. It should be noted, however, that this procedure does not bypass all the sand trapped by the inlet system, only that portion that is deposited within the navigation channel and associated deposition areas. Such bypassing, while critical to helping mitigate the impact of the inlet, does not compensate for the existing levels of shoreline change and sea level rise. Shoreline change model results indicate that fill bypassed to Fire Island would not migrate sufficiently west to have a major impact on the project area beaches. Its contribution to the maintenance of the project would at best be limited during the project life. Bypassing was not considered to be an effective technique to meet the objective of community storm damage protection projects.

Consistent with law and policy and in order to maintain consistency with the 1977 GMP, communities would bear the financial costs of the projects proposed in this EA. To maintain consistency with NPS nonimpairment requirement and the DOI position on beach replenishment, no tapers would be allowed in front of non-developed lands or in front of NPS land, and no southward placement of the dune would be permitted. Beach profile data are consistent with NYSDEC (NYSDEC permits 1993-2003), NJDEP (NJDEP 2000) and modeling and monitoring data (Psuty and Piccola 1991, Psuty and Tsai 1997). They are derived from discussions with coastal processes experts, planners, and policy makers to provide the most effective natural beach and dune barriers. Seasonal restrictions are derived from and consistent with USFWS criteria for T and E species Recovery Plan and Consultation guidance to avoid, minimize and mitigate take (USFWS, letter dated 2/14/03, USFWS 1996 and 2002).

Table 2. Potential Criteria for Beach Renourishment

Process	NPS land/ impact	Seasonal restrictions	Monitoring	Scope/ level	Project design criteria
Communities must apply for all appropriate permits and fund each project without federal expenditures (NPS 1977) Applicant/permitee is responsible for implementing and enforcing all criteria and conservation measures as part of project design and permit conditions	Not on NPS upland, except for small lots within community boundaries and for those small tracts between Kismet and Saltaire and potentially the 2 small tracts between Atlantique and Ocean Beach No tapers outside of community boundaries Equipment transport will occur by water or interior road to avoid and minimize impacts to additional areas of the shoreline whenever possible	February 1- November 1 = Combined safety window Derived from: 3/ 1-9/1 Fire Island (FIIS) Threatened & Endangered species (T&E) protection policy 4/1- 9/1 USFWS Plover window 4/1-11/1 USFWS Amaranth window 5/ 1-11/ 15 Sea Turtle and Marine Mammal NMFS window 10/1-1/31 EFH NMFS window Surveys and monitoring (conservation measures per USFWS, and NMFS protocol) will determine species presence and along with dredge selection will determine allowable project dates	Shoreline and ecological resource monitoring including T & E, pre-project, during, and post project throughout project life USFWS, NMFS and NYSDEC protocol will be used and are included as part of the project requirements Grain size and sediment characteristics of the material to be deposited will be consistent with the existing beach substrate.	Max 6 miles 3-7 projects in 3 years	1) Beach and dune criteria generally insufficient to meet scraping criteria (width less than 100' and 9'NGVD, maximum dune crest width = 30' @ 16.5' NGVD) 2) Design must establish a 9.0' NGVD beach and no tapers on federal property or in front of undeveloped community property 3) duneface slope = 1/4 4) maximum beach construction will allow a maximum of 1:4 slope dune up to a 30' dune crest (15'to seaward and landward of the central dune crestline) @ 16.5' NGVD, 1:4 dune slope down to 9.0' NGVD, 100' of beach @ 9.0 NGVD, 1:15 slope down to 0 NGVD Total beach/dune profile would have the following horizontal dimensions from the inland toe of the foredune to the water: foredune= 90ft (base) + beach berm (100ft) + seaward beach slope (135') = 325 ' from inland toe of foredune. Dune profiles are 16.5' in height, with a 30' crest width and 9.0'NGVD base elevation 5) Constructed dune cannot be displaced seaward of existing dune. Houses on the dune crest, the seaward margin of the dune crest may extend 15' from the central dune crestline. The dune may be widened to extend bebeath existing structures. Fill material will not be considered a new primary dune. If fill cannot be tied to the dune crest, beach fill may still be utilized but no elevation beneath existing structures will be permitted. If no dune exists, or it is very irregular, a dune crestline and accompanying dimesnsions will be developed by the applicant for NPS approval. 6) Must include Interpretation and Education with signs, community involvement and symbolic fencing 7) vegetation preserved or planted with local genetic stock at varying densities from 12" on center to 36" on center 8) all debris removed or reused (fencing) 9) project will meet all USFWS, NMFS and NYDEC T & E species conservation design measures. 10) No nourishment will be permitted which would result in a dune width greater than 30 feet at the crest

Under this alternative, beach nourishment would be considered if the applicant met the following criteria. Each applicant will only be considered for one stabilization/nourishment activity during the scope of this project.

- All necessary local, state and federal permits and approval secured. This will include Section 7 Consultation for Threatened and Endangered species for each project with both the US Fish and Wildlife Service and the National Marine Fisheries Service.

- The beach/dune profile and design parameters were met and the threshold for need was established.

- No placement of the dune will be allowed seaward of the existing dune line. The dunecrest width is always measured from the central dune crestline. This dune must be constructed over the location of the existing dune at the time of the application. All dune crests constructed must be flat or rounded upward (convex) with no swales along the crest. Data to be used by NPS for determining the existing dune position will be one of the following: 2000 LIDAR data; 2002 LIDAR data once available; data supplied by an applicant that presents survey information developed on or after the year 2000 and is agreed upon by the NPS. (See Figure 2)

- Dune template to be constructed will allow a dune with a 30 feet wide crest at 16.5 NGVD. This 30 feet will extend 15' seaward and landward of the central dune crestline – OR – where no dune is present the dune crestline will be located by following the trend of the adjacent (east and west) dune crestlines. All dune crests constructed must be flat or rounded upward (convex) with no swales along the crest. The inland slope of 1:4 will extend to the position of the natural grade. (See Figure 3)

- For those locations where houses are on or seaward of the dune line, the dune crest will follow the same standards and no dune crest wider than 30 feet will be allowed. For any line of houses along the dune crest line exhibiting variation, the project being designed shall pick a relative line along the existing dune crest and apply the design template at that line keeping the criteria established as the basis for that line being proposed. NPS will evaluate any dune crestlines according to the available data as described above from LIDAR or as supplied by the permit applicant and may suggest and require adjustment for permit approvals. (See Figure 4)

  - The beach is always measured from the seaward toe of the dune. From that seaward toe of an existing dune that is already 30 feet wide at the crest at 16.5 feet NGVD, and sloping seaward to the beach at 9' NGVD, the allowable beach width will be 100 feet at 9.0 feet NGVD plus a 1:15 slope down to 0 NGVD which will equal 135 feet for a total of 235 feet from the seaward dune toe down to 0 feet NGVD.

- All debris from past projects/activities is removed as part of the application and pre construction monitoring indicates that no protected beach species are present.

Figure 2. Dune Construction for structures landward of existing dunes

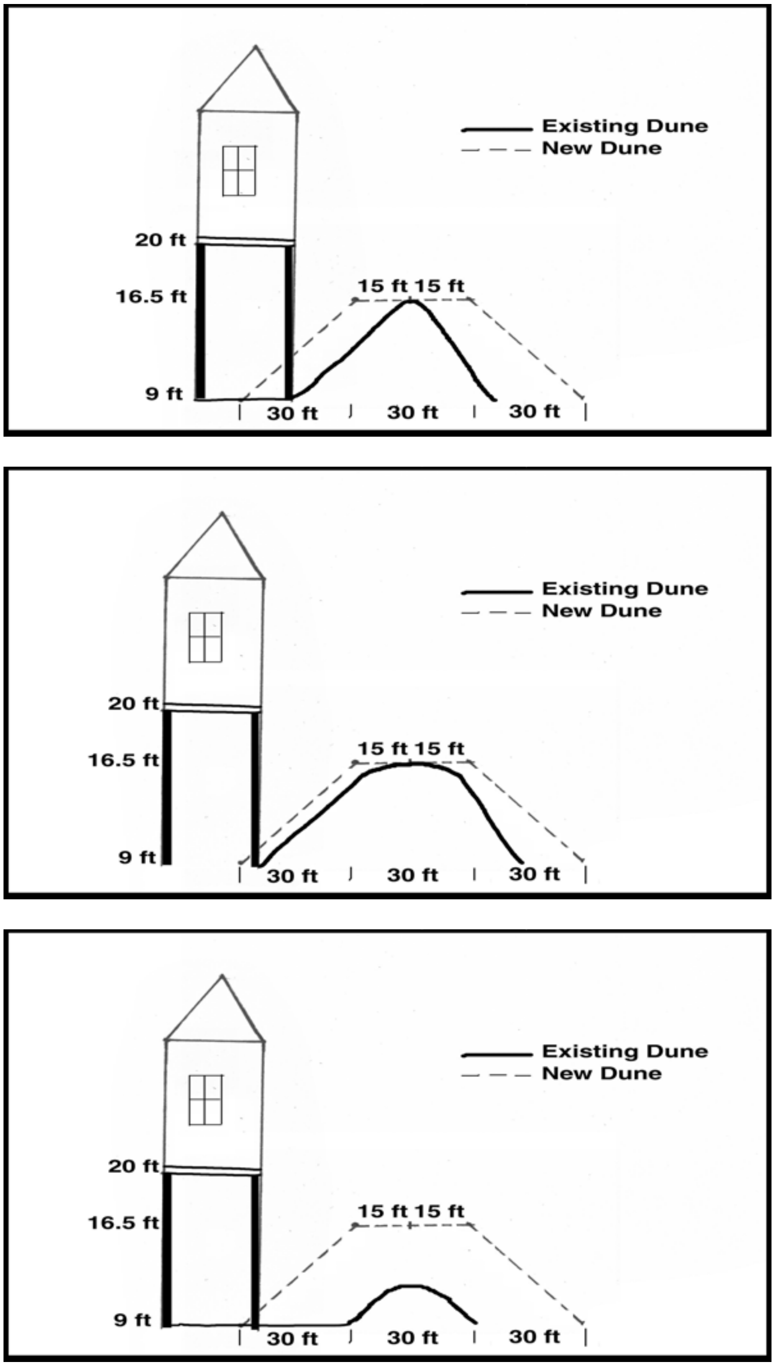


Figure 3. Beach/Dune Template

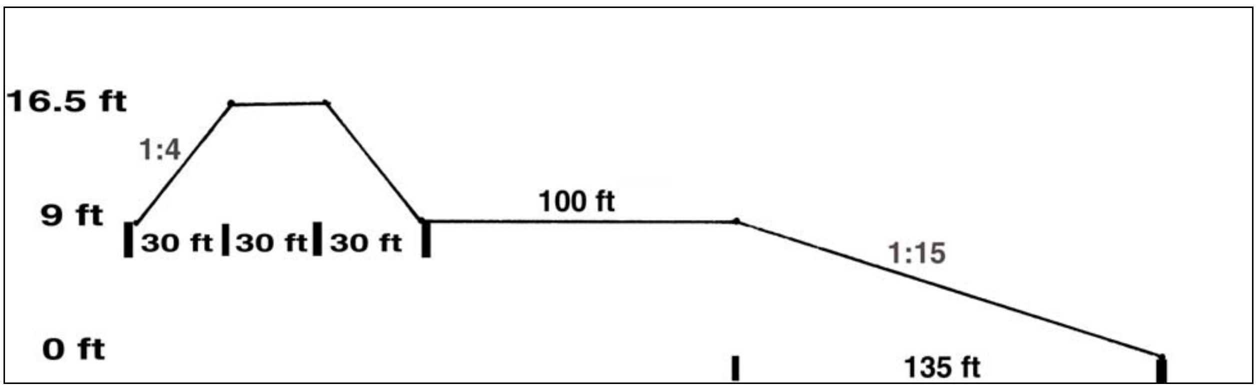
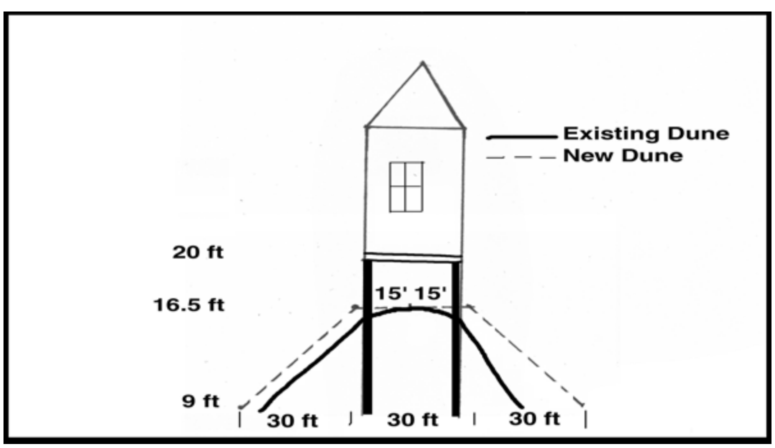
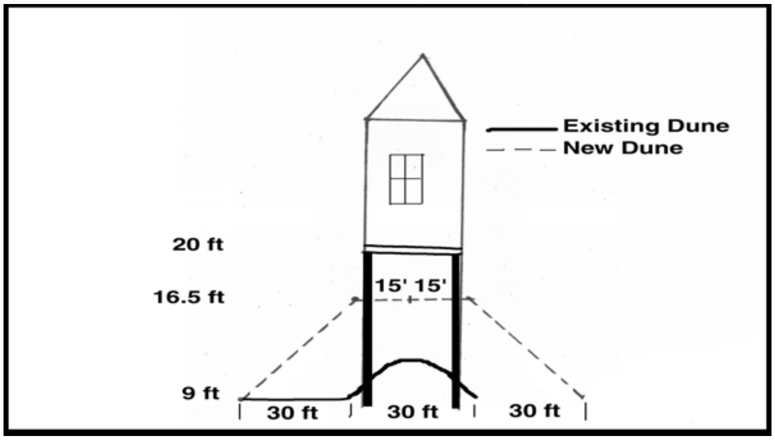
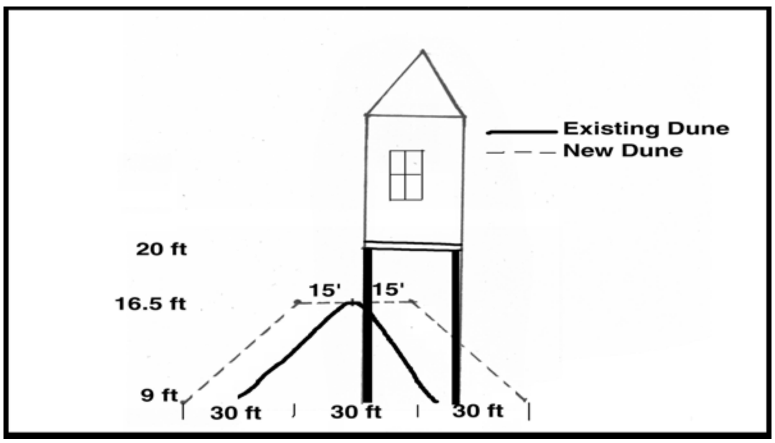


Figure 4. Dune construction for structures on or seaward of the existing dune







Interpretive and Education component is implemented using signs and community involvement. This includes:

- Symbolic fencing to protect the recently established dune and provide for wildlife habitat.

- Applicant will be required to monitor (or pay the cost of monitoring) the beach profile as well as pre- and post-project biological monitoring of beach flora and fauna with protocols developed by the NPS.

- Native species (and genetic stock) dune grasses are used instead of non-native species or stock.

Alternative D. Preferred Alternative - Combination of B and/or C depending upon need and conditions/criteria.

Under this alternative, beach scraping and beach nourishment activities would be considered under the previously identified conditions, including beach profile, natural and cultural resource constraints. Threshold conditions and design of projects would include community conservation, i.e. symbolic fencing and signs, outreach and education, time of year restrictions, community volunteers with NPS monitoring supervision, monitoring program for both beach profile and natural resources.

NPS recognizes that a different need and set of threshold criteria exist for scraping and renourishment, as they are very different activities in scope. NPS recognizes that there are different conditions that would favor one or the other technique, depending upon the need and existing beach profile conditions. For this reason NPS would utilize Alternative D, a combination of both Alternatives B and C, recognizing that they would be used under different conditions. Since the scope of this project potentially includes three (3) renourishment seasons, and since beach conditions are not predictable even during the course of one year, this alternative would allow NPS and communities to meet their needs under differing, unpredictable conditions.

It is anticipated that there is the combined potential for 3-7 nourishment projects and 8-12 scraping projects during the time frame of this project covering the maximum of 6 miles of community flanked shoreline. There is also the potential that if renourishment were used in one area, that scraping may not be needed in another, or vice versa, that scraping be utilized to stabilize and maintain the renourished area after a storm.

ALTERNATIVES CONSIDERED BUT REJECTED

Nourishment Projects exceeding criteria established above

Beach nourishment projects that exceed the critera above have been rejected due to the uncertainty of the impacts they would pose to the barrier island ecosystem. These projects would include those that would establish a constructed dune larger than the dimensions outlined above, tapers on one or both ends of the project which would go beyond the community boundary, which would build the existing beach above 9.0 feet NGVD, or which would establish a new primary dune or a dune line south of current conditions. Any or all of these design features for a proposed project would make that project inconsistent with the criteria established and therefore have not been considered under this EA.

Hard Structures

Groin construction/removal and notching

Groins are coastal structures that are normally constructed perpendicular to the shoreline, extending from the back beach area into the water and are designed to retard shoreline change on a long-term basis. Properly designed groins can reduce shoreline change in the immediate design area, however, they can also create additional non-local shoreline change patterns depending upon the design. The long-term nature and major effects of groins and other hard structures extend beyond the scope and length of this project's need to provide an effective mechanism to respond to beach storm damage currently until the results of the Reformulation Study are implemented. This alternative fails to meet the objectives since it fails to provide adequate storm protection on a broader, coordinated community spatial scale as well as a shorter temporal scale as it is not readily reversible as an interim feature.

Concrete breakwaters/bulkheads, seawalls

Breakwaters are structures that protect beaches from wave action by dissipating wave energy before it reaches the beach. A decrease in wave energy will reduce sediment transport, thus reducing the shoreline change rate. The breakwater does not, however, provide protection from tidal surges and is not readily reversible; therefore, this plan was eliminated from further development.

Bulkheads are normally anchored or cantilevered vertical sheet pile walls. These structures are intended to retain fill material, and are generally not exposed to severe wave action. Bulkheads, like seawalls, must be designed with scour protection. Elevations of vertical bulkheads must be sufficient to minimize overtopping which can lead to erosion of backfill and subsequent failure of the structure.

Seawalls provide upland erosion protection and are usually employed to protect upland structures from erosion and flooding damage. Seawalls provide some storm protection for the backshore areas. Many seawalls cause scour problems in the beaches fronting them, which could become a potential safety hazard.

The long-term nature and major effects of these hard structures extend beyond the scope and length of this project's need to provide an effective mechanism to respond to beach storm damage currently until the results of the Reformulation Study are implemented. This alternative fails to meet the objectives since it fails to provide adequate storm protection on a broader, coordinated community spatial scale as well as a shorter temporal scale, as it is not readily reversible as an interim feature. Since this alternative is not reversible and fails to check erosion of existing beaches. It was therefore eliminated from further consideration.

Geotubes

Geotubes have been used along the coast as well as nearby FIIS with mixed results. They are considered hard structures whose impact and project life extend beyond the scope of this project, and therefore are eliminated from further consideration.

Emergency Actions

Sandbags have been used in the past in flood and storm situations as emergency, stop-gap measures. They are not considered to provide adequate protection in and of themselves for protection of community property. Should emergency situations arise for temporary protection of structures, sandbags may be used for those emergency measures related to storm protection. This will be on a case by case basis in order to ensure protection of septic and electrical systems so as not to create a health or safety hazard or cause additional demise to park resources.   Authorization will be a one time authorization and be implemented with an NPS Letter of Authorization. It will be for a one time installation not to exceed a period of six months and removal of the sandbags will be stipulated. Sandbags will only be allowed during the duration of the EA as stipulated earlier.

In the event of a breach and an emergency is declared, the Breach Contingency Plan would take effect and provide for emergency remedies. Although, the Breach Contingency plan has expired as far as the US Fish and Wildlife is concerned, the Army Corps might still act pursuant to its approach if a breach were to occur. At present, both of these agencies are directing efforts to gather the information necessary for FWS to conduct a consultation based upon another four years of time until the FIMP has developed a long-term plan for breach management.

Non-Structural Alternatives
Non-structural alternatives such as those listed below would likely be used in combination, as a suite of tools, as opposed to any one being used alone. These alternatives are not considered under this short-term project since they are outside of any short-term goals.

Acquisition
Permanent evacuation of existing areas subject to erosion or inundation involves the acquisition of this land and its structures either by purchase (willing buyer/willing seller), donation, or by exercising the powers of eminent domain. If, through the FIMP an alternative was developed that might follow this scenario, all development in these areas would be either demolished or relocated. The Fire Island structural values exceed $640 million according to the Army Corps of Engineers Fire Island Interim Plan draft EIS. A buy-out scenario would be focus primarily on the Coastal Erosion Hazard Area, which currently includes approximately 35 developable vacant lots, approximately 120 additional undeveloped lots, and approximately 380 developed lots.

The estimated cost to buy out all of these lots and structures located within the CEHA is $163 million (Fire Island Ecology, 2000). Legal authority exists for the National Park Service to acquire a property with a 25 year, or life reservation for the owner to remain in residence. These are referred to as “Use and Occupnacies”. At the conclusion of the reserved time, the NPS would then have possession. While acquisition costs are less, they would still be considerable. These approaches as short term interim measures, are both prohibitively expensive and socially unacceptable, and were dropped from consideration as stand-alone options under this EA.

Removal, relocation
Development on Fire Island has been steadily decreasing since the 1960's and 1970's, and has slowed to less than two units per year since 1991. Currently, there are about 4,100 structures on Fire Island (USACE, 1999), with very little developable land remaining. Based on a comparison of the most recent available structure survey maps with 1998 aerial photographs, it has been estimated that there are only approximately 35 available lots left for development on the entire island (USACE, 1999). Inspection of the affected communities revealed that the majority of threatened properties are not located in close proximity to a vacant lot that could be utilized for relocation. It should be noted that the majority of lots located within the affected communities are situated on small single and separate parcels with existing lot coverage maximized per current zoning regulations. This small lot size does not provide for any significant space to relocate homes landward. Additionally, vacant lots adjacent to threatened parcels are not available for relocation. Implementation of relocation/retreat for threatened structures was undertaken on a limited number of parcels after the severe 1992/93 storms devastated the northeast Atlantic coastline. At this time, houses that required relocation and incorporated lots large enough to accommodate retreat or relocation were moved farther landward or reduced in size. Therefore, little opportunity now exists within the communities to further develop this option.

The federal, state and local agencies, as a part of the FIMP, are exploring an alternative based upon the idea of a land exchange program. This alternative would consider, and where appropriate given geographic and other considerations, lands currently owned by the NPS and between or adjacent to existing communities, could be re-designated as part of the Community Development District and platted as lots. These would then be available for land exchanges with parcels that are currently located in areas of coastal hazard, including, at least, the CEHA. The criteria for eligibility for exchange, the federal lands which would be converted from open space to developed parcels, and the practical arrangements for layouts, utilities, etc. all need further planning and full consideration under NEPA. While land exchanges can occur under existing authorities, at present there are very few federally owned parcels which exist within the designated communities, so this large-scale program is not being considered as an alternative in this EA.

Flood proofing
In developing the FIIP, the Army Corps evaluated a nonstructural plan consisting of a combination of floodproofing, structure raising, ring walls, and buyouts to protect structures on both the mainland and the barrier. The FIIP screening analysis, again for both the mainland and Fire Island, identified nonstructural measures to provide a 44-year frequency level of protection and would require floodproofing over 9,500 buildings, raising over 3,600 buildings, and providing ring walls for approximately 150 buildings. The preliminary initial cost estimates ranged between $400 million and $500 million (USACE 1999). We have not

separately estimated those costs of flood proofing limited to Fire Island alone. This option was eliminated from consideration as an interim measure due to the comparatively high cost, and the fact that it is not readily reversible. Nonstructural alternatives were considered long-term, beyond the scope, and were eliminated from further consideration from this EA, since this is a short-term project alternative evaluation.

Zoning

When Congress enacted FIIS-enabling legislation, the law mandated the Secretary of the Interior to establish federal zoning regulations. These regulations provide standards for local zoning to protect and preserve Fire Island, and they exist solely as an overarching law to which local ordinances must conform in order to exempt private properties from the condemnation authority of the Secretary of the Interior. FIIS Federal Zoning Regulations provide a set of standards for the use, maintenance, renovation, repair, and development of property within FIIS. The standards are intended to protect land within the national seashore using several means. These include controlling population density and protecting natural resources, limiting development to single-family homes, and prohibiting any new commercial or industrial uses. NPS is not responsible for enforcing the federal zoning standards in the communities and villages; despite the presence of federal regulations, local governments maintain regulatory jurisdiction. The federal government ensures local compliance with the federal law by maintaining the power of condemnation. As long as local zoning ordinances and permit actions conform to standards issued by the Secretary of the Interior, the federal power of condemnation is suspended. If a particular project is proposed which is inconsistent with the federal standards, the seashore may inform the town and the landowner that it has lost its protection from condemnation, and choose to take enforcement action at a subsequent time.

Current federal zoning controls have a 35 percent lot occupancy requirement, require that base building heights conform to the minimum elevation established by the federal flood insurance program, require a minimum lot size of 4,000 square feet, and discount any portion of a lot from the minimum lot size if it lies below the southerly toe of the foredune.

Development activity near the ocean shore is of particular concern on Fire Island. Structures built too close to the primary dune could interfere with its natural functioning and weaken its ability to withstand wave and wind attack. Unfortunately, these locations have always been very attractive for beach-home development and there is considerable development of oceanfront property. Using the area seaward of the proposed coastal erosion hazard line as an indicator of the issue, there are approximately 380 structures (virtually all are houses) in a position to compromise the primary dune and to suffer severe storm damage themselves.

Although the Coastal Erosion Hazard Management Act (CEHA) precludes new development or redevelopment within the primary dune area, the capacity to enforce these restrictions is limited by the presence of pre-existing, nonconforming structures within the existing primary dune. The intent of restricting development is to avoid human impacts on natural processes. While the landowners immediately north of an empty lot will derive some protection from continuation of a vegetated land form seaward of their parcel, and development of that parcel will impede and prevent that protective function, when the empty lot is flanked by existing structures, it is hard for local regulatory agencies to deny construction permits for the last scattered empty lots. Of additional concern is the fact that no major additions to existing structures or any new construction is permitted on the primary dune, but both can occur on secondary dunes. Since the intent of this EA is to avoid permitting any project of sufficient magnitude or impact that would trigger a full EIS, no proposal will be permitted which could convert current primary dune areas into secondary dune areas.

A review of the Tax Assessor's records for construction over the past 50 years in the Towns of Islip and Brookhaven found a pattern of steady development within the proposed CEHA area. A moving nine-year average of annual construction rose to a peak in the late 1960's and another peak in the early 1970's (when more than 40 oceanfront beach homes were built in Fire Island Pines in one year), before tapering off as the supply of such properties diminished. Since 1991, even accounting for a recent rush to build before CEHA is adopted, the annual rate of development on the oceanfront has been less than two units a year. Based on a comparison of the most recent available structure survey maps with 1998 aerial photos, an estimate of the number of lots in the proposed CEHA area that could be developed after CEHA is adopted is estimated at 35.

AFFECTED ENVIRONMENTS

Natural Resources

Marine Resources

Water Quality

Data collected from 1977 through 1997 indicate that water quality in the Great South Bay is generally good (Suffolk County, 1999). Throughout the 20 year monitoring period, more than 2,600 water samples were collected and analyzed from 20 locations in Great South Bay. Data collected at sampling stations included concentrations of nitrogen, phosphorous, dissolved oxygen, salinity, fecal coliform bacteria, chlorophyll-a, and *Aureococcus anophagefferens*, the organism that causes brown tides in the bay. Water transparency also was measured at each station. Water transparency, which is a measure of the distance that light is transmitted through water, may be reduced by a variety of factors, including increased concentrations of suspended and dissolved materials. In addition to Great South Bay, water quality also was evaluated in Moriches Bay and Shinnecock Bay during the monitoring period.

During the monitoring period, no dramatic trends in water quality were apparent in Great South Bay, although most variables exhibited great, annual variation. The most consistent trend over time was increased nitrogen in the bay with highest concentrations generally along the bay's north shore.

Near the project area, data was collected from several sampling locations, including Station 150 located slightly northwest of Talisman Beach (Suffolk County, 1999). Throughout the monitoring period, data from Station 150 indicated slight increases in nitrogen and chlorophyll-a concentrations, with similar trends apparent throughout the bay. Other variables, including water transparency and dissolved organic phosphate, decreased slightly over time. In general however, most measurements indicated water quality in the area was relatively stable from 1977 to 1997.

Offshore Environment/Borrow Area

Recent works by ACOE for the Interim Project, Shinnecock Project, Reformulation Project and New Jersey Coast Biological Monitoring Program (BMP) (ACOE, 1996-2002) provides the best available scientific information and have described these resources in detail. Excerpts are presented here to summarize these important resources for impact analysis.

The Offshore Environment is defined as the marine zone from the 3 fathom (18-foot) contour to 3 miles offshore of the barrier island. The proposed offshore borrow area (known as Area 2) is approximately 3,000 acres and is located approximately ½ to 1½ miles offshore of Cherry Grove in approximately 30 to 60 feet MLW of water. When the 1996 survey was conducted by the Army Corps of Engineers, the estimated quantity of suitable sand was 17,747,280 Cubic Yards. The vicinity around the borrow area consists primarily of fine to medium sands (> 90 percent), with little or no relief in topography, with the exception of two potential cultural resources in the northwest and southeast quadrants of the borrow site (Reiss 1996). There are no wrecks or rock piles evident on the National Oceanic and Atmospheric Administration (NOAA) navigation chart in the vicinity of the borrow area (Reiss 1996).

There are no known Hazardous, Toxic, Radioactive Waste (HTRW), Comprehensive Environmental Response, Compensation, Liability Act (CERCLA) or Resource Conservation and Recovery Act (RCRA) sites within the study area; therefore, no HTRW impacts are expected. Since sediments beneath navigable waters proposed for dredging are regulated as HTRW only if they are within the boundaries of a site designated by the U.S. Environmental Protection Agency (USEPA) or a state for a response action or if they are part of the National Priority List (NPL) site under CERCLA, no preliminary assessment for HTRW at the borrow area was necessary.

Sand from the borrow area is predominantly quartzose sand. As such, it lacks affinity for binding of contaminants. The extremely low organic carbon and clay content of the borrow area sediments makes the presence of contaminants, at other than trace levels, extremely unlikely. Borrow area investigations revealed that clay channels exist within the delineated borrow area. As currently planned, dredging for this project will avoid the channels, so the clay layers will not be affected. Furthermore, the borrow area is geographically removed from the direct influence of any known point source of contaminants and from any historical disposal area.

Invertebrates
Results of invertebrate sampling by RMC Environmental Service in 1996 and 1997-98 by Vittor and Associates, Inc. for macrobenthic invertebrates (i.e., small clams, worms, and arthropods) (ACOE 1998) reported the presence of 54 taxa of macroinvertebrate with a mean density of 2,334.7/m2 at the Fire Island borrow sites. Digger amphipods (*Protohaustorius wigleyi,* 47.4 percent), fringed worms (*Tharyx acutus*, 28.7 percent), polychaete worms (*Magelona papillicornis*, 9.2 percent), and dwarf tellin (*Tellina agilis*, 15.2 percent) represented the bulk of the species' composition in the RMC sample.

Two additional nearby potential borrow areas were also sampled (ACOE 1998) for macrobenthic invertebrates (i.e., east of Shinnecock Inlet and off Fire Island) during 1997 and 1998. Benthic macroinvertebrate data collected in July 1996 from the Fire Island and Shinnecock Inlet borrow areas by RMC Environmental Services (Greeley-Polhemus Group, Inc. 1997) were compared to similar data collected by BVA in 1997 (Barry A. Vittor & Associates, Inc. 1999). These data were combined with data collected in 1998 to examine trends in macroinvertebrate assemblage structure.

The macroinvertebrate assemblage in the Fire Island borrow area during July 1996 was dominated by the polychaetes, *Tharyx acutus* and *Magelona papillicornis* and the bivalve, *Tellina agilis*; the assemblage in the same borrow area in June 1997 was dominated by a polychaete assemblage that included *T. acutus* and *Asabellides oculata,* and the families, Cirratulidae and Maldanidae. The Fire Island borrow area assemblage in November 1997 was dominated by the polychaetes, *A. oculata* and *Polygordius* spp. and the amphipod, *Gammarus annulatus.* In June 1998, the macroinvertebrate assemblage was dominated by oligochaetes, rhynochocoels, and the polychaetes, *Polygordius* spp. and *Brania* spp. In October 1998, the assemblage was dominated by *Polygordius* spp. and the bivalves, *Spisula solidissima* and *Tellina agilis.*

The macroinvertebrate assemblage in the Shinnecock Inlet borrow area during July 1996 was dominated by the amphipods, *Protohaustorius wigleyi*, *Psammonyx nobilis* and *G. annulatus* and the bivalve, *Tellina gilis;* the assemblage in the same borrow area in June 1997 was dominated by the amphipods, *P. nobilis* and *Protohaustorius* spp. B, and the polychaete taxa, *Spiophanes bombyx* and Ampharetidae (LPIL). The Shinnecock Inlet borrow assemblage in November 1997 was dominated by the bivalve, *Spisula solidissima*, sand dollars (Echinoidea [LPIL]), probably *Echinarachnius parma*), the polychaetes, *Polygordius* spp., and the amphipod, *Tanaissus psammophilus*. The assemblage in June 1998 was dominated by oligochaetes, rhynchocoels, and the polychaete, *Scolelepis squamata*. The dominant taxa in October 1998 were the polychaete, *Polygordius* spp., and the amphipods, *P. wigleyi* and *Protohaustorius* spp.

The dominant species identified were the fringed worm (*Tharyx acutus*), ampharetid worm (*Asabellides oculata*), archiannelid worm (*Polygordius spp.*), and unidentified individuals from the family Cirratulidae and Maldanidae. Abundant bivalve species included the dwarf tellin, the surf clam (*Spisula solidissima*), and chestnut astarte (*Astarte castanea*), while the crustaceans were best represented by the scud amphipod (*Gammarus annulatus*), (*Pseudoleptocuma minor*) and the sharptailed cumacean (*Diastylis polita*).

There are comparable studies from similar habitats, including the most recent U.S. Army Corps of Engineers (ACOE) 1998 Biological Monitoring Program for the Atlantic Coast of New Jersey from Asbury to Manasquan. Additional information is provided in the following reports, by RMC Environmental Service (1996) for the Shinnecock Inlet borrow site; Cerrato (1983) for the borrow site in upper bay New York Harbor; Ray & Clark (1995), for the borrow sites of Monmouth County, New Jersey; and Steimle & Stone (1973) and Franz & Harris (1988) for mapped benthic populations throughout the New York Bight. All of these studies report comparable findings on macrobenthic communities associated with proposed borrow site locations.

Based on the fact that beach nourishment requires the use of medium sands it is thereby assumed that the benthic community most affected will be dominated by organisms found in these sands. These communities are best characterized by amphipods such as the digger amphipod (*Acanthohaustorius millsi*), *Psammonyx nobilis*, the scud amphipod (*Gammarus annulatus*), the digger amphipod (*Protohaustorius wigleyi*), *Pseudoleptocuma minor*, and the sharp-tailed cumacean (*Diastylis polita*). In addition to the amphipods, large numbers of the archiannelid worms (*Polygordius spp.*) can be expected, as well as several polychaetes including *Magelona papillicornis*, ampharetid worm (*Asabellides oculator*), mudworm (*Spiophanes bombyx*), and fringed worm (*Tharyx acutus*). Shellfish typically present in the sand community are the surf clam and the dwarf tellin. Biomass will almost certainly be dominated by the surf clam or sand dollar (*Echinarachnius parma*). These species are universal to six previously reported studies and only vary in overall abundance between studies.

Invertebrates are the primary food source for many predatory species, such as finfish. The relationship between the benthic invertebrate communities and predatory species such as finfish is presently being defined for the borrow sites through the ongoing and planned fisheries studies in conjunction with the ongoing and planned invertebrate sampling programs (BRAT, Biological Resources Assessment Technique) for the ACOE Reformulation Study.

Organisms in the Water Column (Planktonic Forms)

The water column contains several marine species from different trophic levels throughout the year. Most of these species are transient, and are not dependent on the presence of the borrow pits. Zooplankton including ichthyoplankton will be present in the water column above the borrow pits in varying degrees of abundance and diversity as the seasons change. The zooplankton population consists primarily of several copepod species, such as *Acartia hudsonica*, *A. tonsa*, *Temora longicornis*, *Labidocera aestive*, and *Pseudocalanus* spp. Zooplankton densities can approach levels in excess of 100,000 individuals per 100 cubic meters of water at certain times of the year, particularly in March and April, when zooplankton abundance typically peaks.

Along with seasonal concentrations of adult finfish that occur in the study area, eggs and larva (ichthyoplankton) will also be present, mainly from April through July. Although ichthyoplankton surveys are not being conducted in the field program, it is reasonable to assume that species spawning both offshore, in Shinnecock Bay, and in the Great South Bay will be transported through the study area. The fish larvae feed primarily on plankton, so the abundance and diversity of the fish larvae are strongly influenced by the plankton population. Species expected to be observed include both bluefish and summer flounder, which spawn offshore. The developing larvae drift inshore into the bays. Atlantic herring (*Clupea harengus*), red hake (*Urophycis chuss*), spotted hake (*Urophycis regia*), and striped and northern searobin (*Prionotus evolans* and *carolinus*, respectively) are all nearshore spawners. The American sandlance (*Ammodytes americanus*), an offshore and important baitfish species to many piscivorous fish, spawns throughout the winter months, and occurs in the study area.

Megabenthic invertebrates (e.g., shellfish, squid, and crustaceans) collected for the West of Shinnecock Inlet Interim Project during the otter trawls (ACOE, 1998). A total of 22 species of megabenthic invertebrates were collected. The dominant species collected was the sand dollar. The 22,157 individuals collected represented 53 percent of the total catch.

Shellfish

Approximately 24 species of shellfish occur in the waters around Fire Island National Seashore (NYS DOS 1999a). Two species with commercial importance are the surf clam (*Spisula solidissma*) and the ocean quahog, or black clam (*Pitar morrhuanus*). Surf clams are found from the lower intertidal zone to the sub-tidal zone and occur at depths of up to approximately 100 feet. Black clams are considered an offshore species and are typically found at depths of approximately 25 to 585 feet (USACE 1999). Examples of other shellfish species occurring in the area include Atlantic oyster drill (*Urosalpinx cinerea*), blue mussel (*Mytilus edulis*), channeled whelk (*Busycon canaliculatus*), razor clams (*Siliqua costata*), and northern moon *snail (Euspira heros*)(NYS DOS 1999a).

Surf clams represent a significant standing crop to commercial fishermen. A 1966 survey conducted by the New York State Department of Environmental Conservation showed high inshore surf clam densities between Fire Island Inlet and Moriches Inlet. Densities are variable and depend on location. Based on the New York State Department of State technical report on molluscan shellfish in the South Shore Estuary, no commercially viable shellfish beds occur within or immediately adjacent to Fire Island National Seashore; however, beds do exist to the west of the seashore boundary in the Great South Bay (NYS DOS 1999a).

Numerous species of crustacean shellfish occur and are harvested in the waters around Fire Island National Seashore, including blue crab (*Callinectes sapidus*), Jonah *crab (Cancer borealis*), rock crab (*Cancer irroratus*), lady crab (*Oyalipes ocellatus*), marsh fiddler *crab (Uca pugnax*), spider crab (*Libinia* spp.), hermit crabs (Family Paguridae), and the horseshoe crab (*Limulus polyphemus*). Blue crabs are commercially harvested with crab pots. Crabs are typically caught using collapsible traps, hand lines, and dip nets. Recreational crabbing for lady crabs occurs in and near Fire Island Inlet during the summer, and recreational crabbing for rock crab occur in the same area during late fall. Blue crabs are taken from late spring to early autumn at night from boats, docks, and piers using a dip net and spotlights (NYS DOS 1999b).

Finfish

Trawl samples were collected monthly from April 1999 to April 2000. A total of 176 samples, six at each of the 16 stations, were collected. Table 4 presents a summary of the trawl catch by taxa, monthly total, total catch and percent composition. A total of 47 finfish species were collected. The dominant species collected was the butterfish (*Peprilus triacanthus*). The 13,759 individuals collected represented 31.7 percent of the total catch. The second through sixth ranked fish species by abundance, were scup (*Stenotomus chrysops*), bay anchovy (*Anchoa mitchilli*), little skate (*Raja erinacea*), spotted hake (*Urophycis regia*), and winter skate (*Raja ocellata*), respectively. These, along with windowpane (*Scophthalmus aquosus*), red *hake (Urophycis chuss*), striped searobin (*Prionotus evolans*) and silver hake (*Merluccius bilinearis*), comprised 95 percent of the total catch.

Beach Ecosystem

There are two types of soils in the project area, beach sediments and dune sediments. Beach sediments are located landward of the mean tideline to the base of the foredunes. These sediments are composed primarily of quartz sand with low silt. The mean grain size is 0.39mm in the western communities and 0.34mm in the community of Fire Island Pines.

Dunes are large aeolian sand deposits without soil horizons found parallel to the shoreline. Dunes in the project area are expected to range in height from 15–20'. However, both the beach and dune soils resources have been critically eroded, and the native vegetation is currently very sparse on both.

Ocean-Beach Invertebrates
Because of the potential for direct impacts, the sessile (immobile) organisms of the sand placement zone are discussed separately in the following section. Species composition varies between the upper high tide zone marked by the wrackline (line of seaweed and debris deposited at high tide), the mid-tide zone, and the surf zone. The mid-tide zone can be further divided into the wet, saturated, and swash zone. The upper end of the zone is dominated by the beach flea amphipod (*Talorchestia longicornis*), a nocturnal species burying into the sand during the day (Gosner 1979). The mid-tide zone is dominated by the mole crab (*Emerita talpoida*), the amphipods (*Haustorius canadensis* and *Psammonyx nobilis*), and the polychaete worm (*Scolelepsis squamata*) (Reilly 1978, Kluft 1998, Gosner 1979, EEA 1998, work in progress). Many of the species in the surf zone are similar to those present in the mid-tide zone. In the surf zone, there are large numbers of the lady crab (*Ovalipes ocellatus*) during the summer months. The lady crab migrates to deeper water in the winter. All density levels fluctuate greatly with the seasons. Late spring, summer, and early fall are the most productive season.

Birds

Shorebirds.
Fire Island and the surrounding bays and small islands provide habitat for a variety of both resident and migratory shorebirds. Shorebirds migrate annually between the Arctic and as far south as South America, moving through the area throughout the year. Northward migration, commonly known as spring migration, begins late winter, peaks in May, and lasts through June. Southward, or fall, migration begins in late June with peaks in late July and August and lasts into fall (NYS DOS 1998a). Up to 14 shorebird species have been recorded annually in four South Shore Estuary Christmas Bird Counts. Three of the bird counts include areas of Fire Island National Seashore in the Great South Bay, Narrow Bay, and Moriches Bay. Dunlin (*Calidris alpina)* account for an average 70% of shorebirds counted. Other common species are sanderling (*Calidris alba*) and black-bellied plover (*Pluvialis squatarola*), and piping plover *(Charadrius melodus)*. A few birds, such as dunlin, black-bellied plover, sanderling, purple sandpiper (*Calidris maritima*), and common snipe (*Gallinago gallinago*) overwinter in small numbers (NYS DOS 1998a).

Migratory shorebirds use the beaches, marshes, and especially the intertidal flats as feeding grounds. Flocks of semi-palmated plovers (*Charadrius semipalmatus*), least sandpipers (*Calidris minutilla*), dunlin, semi-palmated sandpipers (*Calidris pusilla*), sanderlings, western sandpipers (*Calidris mauri*), purple sandpipers, short-billed dowitchers (*Limnodromus griseus*), black-bellied plovers, piping plovers, and yellowlegs (*Tringa* spp.) feed on invertebrates that occur in the tidal flats, salt marshes, and ocean beaches in the area. After feeding the birds rest on beaches above the high tide line and on the small islands in the area (USACE 1999).

The complex of flats, marshes, and spoil islands in Moriches Bay near the inlet are recognized as one of the best and most consistent shorebird concentration areas in Nassau and Suffolk Counties. Approximately 490 acres of tidal mud and sand flats are found near the inlet surrounding the East and West Inlet Islands. The major concentration of shorebirds at this site occurs during the fall and is comprised primarily of semi-palmated plovers, black-bellied plovers, lesser and greater yellowlegs, semi-palmated sandpipers, least sandpipers, and short-billed dowitchers (NYS DOS 1998a).

Terns, Gulls, and allies

Roseate terns (*Sterna dougali*), least terns (*Sterna antillarum*), common terns (*S. hirundo*), Black Skimmer (*Rynchops niger*), and various gulls including greater black backed gulls (*Larus marinus*), herring gulls (*Larus argentatus*), ring billed gulls (*Larus delawarensis)*, and laughing gulls (*Larus atricilla*) frequent Fire Island. Gulls are not considered threatened or endangered and are thus not considered in depth. There are several tern species that are either federally listed or state listed and those are addressed in the special status species section later in this document. During the winter months a couple of larger northern gull species such as the glaucus gull (*Larus hyperboreus) and Iceland Gull (Larus glaucoides)* can also be found feeding amongst the resident gull species on surf clams, rock crabs, and other larger prey contained in the wrackline and ocean beaches. Also during the winter months several species of more diminutive gulls such as Bonaparte's gull (*Larus philadelphia),* little gull (*Larus minutus), and* black-headed gull (*Larus ridibundus)* can be seen hovering/dipping in the inshore ocean waters feeding on small swimming invertebrates.

Waterfowl.

Great South Bay is the largest enclosed, shallow saltwater bay in New York. The bay supports large concentrations of migrating and wintering waterfowl, particularly greater scaup (*Aythya marila*), American black duck (*Anas rubripes*), brant (*Branta bernicla*), red-breasted merganser (*Mergus serrator*), common goldeneye (*Bucephala clangula*), and bufflehead (*Bucephala albeola*). Based on aerial surveys conducted by the New York State Department of Environmental Conservation, Great South Bay supports the largest wintering waterfowl concentrations in the South Shore Estuary Reserve and the state (due, in part, to the large size of the survey segment) (NYS DOS 1998a).

Scaup use the Great South Bay for resting and feeding on benthic invertebrates such as clams, mussels, and snails throughout the bay. Concentrations of diving ducks occur in shallow waters on the bayside of Fire Island National Seashore at Point O'Woods, Barrett Beach, and Long Cove. Notable concentrations of dabbling ducks occur in the marshes on the bayside of Fire Island, and around East and West Fire Islands. Sea ducks, like the long-tailed duck (*Clangula hyemalis*) and diving ducks such as scoters (*Melanitta* spp.)(NYS DOS 1998a).

The barrier island shoreline along Moriches Bay is characterized by extensive salt marshes and tidal flats. About 50% of the Moriches Bay area is characterized by marshes and shoals. The waters of Moriches Bay support significant concentrations of wintering waterfowl, especially scaup and American black duck, and lesser numbers of Canada goose (*Branta canadensis*), brant, mergansers, mallard (*Anas platyrhynchos*), mute swan (*Cygnus olor*), canvasback (*Aythya valisineria*), common goldeneye, and bufflehead. Based on aerial surveys, Moriches Bay has the highest average concentration of canvasback of the south shore bays. The most important areas for dabblers are the flats and marshes behind Fire Island in western Moriches Bay, the marshes around the William Floyd Estate, and the marshes that occur where the freshwater streams feed into the bay, particularly in eastern Moriches Bay. Scaup concentration areas in Moriches Bay include the open water areas near the William Floyd Estate, the center of the bay east of Moriches Inlet, and in eastern Moriches Bay (NYS DOS 1998a).

Raptors.

Numerous species of raptors have been identified on Fire Island National Seashore, including sharp-shinned hawk (*Accipiter striatus*), turkey vulture (*Cathartes aura*), northern goshawk (*Accipiter gentilis*), Cooper's hawk (*Accipiter cooperii*), red-tailed *hawk (Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), broad-winged hawk (*Buteo platypterus*), rough-legged hawk (*Buteo lagopus*), bald eagle (*Haliaeetus leucocephalus*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), osprey (*Pandion haliaetus*), and gyrfalcon (*Falco rusticolis*). Owl species include barn owl (*Tyto alba*), screech owl (*Otus asio*), snowy owl (*Nyctea scandiaca*), long-eared owl (*Asio otus*), short-eared owl (*Asio flammeus*), and saw-whet owl (*Aegolius acadicus*) (Buckley et al. in press).

Fire Island National Seashore serves as a migration corridor for raptors, with average migration totals of 5,000 hawks and a maximum total of 6,654 between 1980 and 1995 (NY Audubon 2002). Each autumn, large numbers of merlins (*Falco columbarius*), American kestrels, and peregrine falcons (*Falco peregrinus*), sharpshinned hawks, Cooper's hawks, osprey, bald eagles (*Haliaeetus leucocephalus*), and others (in addition to passerines) use the barrier island as a stop-over location during migration.

Terrestrial Invertebrates

A butterfly survey conducted in 1999, 2000 and 2001 on Fire Island National Seashore from the Robert Moses State Park eastern boundary to Smith Point County Park found a total of 45 resident and migrant species of butterfly (superfamilies Papilionoidea and Hesperioidea) to live on the island (S. Finn, 2002). Some butterfly species found on Fire Island were also found to use the ocean beach areas as well particularly during spring and autumn migrations. These included the monarch (*Danaus plexipus*), question mark (*Polygonia interrogationis),* mourning cloak (*Nymphalis antiopa*), american lady (*Vanessa virginiensis*), and red admiral (*Vanessa atalanta).*

Another presence/absence study was conducted in 2000 on Fire Island National Seashore targeting Odonates (suborder Anisoptera) and a total of 16 species were identified (S. Finn, J. Rand, 2000). These species utilize a variety of habitats, but can be found on the beach areas as well . An example of their seasonal use occurrence is that of the monarch migration and during the autumn southern migration when dragonfly species such as the green darner (*Anax junius*,), spot-winged glider (*Pantala hymenaea*) and the wandering glider (*Pantala flavescens*) can be found in great numbers at times heading westward down the island.

Beach and Dune Vegetation

Floral communities are important to the formation, persistence, and health of beach and dune environments. For instance, primary dunes are created by the slow accumulation of aeolian sand at the base of beach vegetation, particularly American beachgrass (*Ammophila breviligulata*), and beach debris. The root and rhizome systems of beach flora together with mychorizal fungi then serve to bind together fine sand and soil particles, thereby minimizing shoreline change and stabilizing the dune. Remaining plants and their rhizomes still attached to a dune may also aid in the repair/re-accretion of sand on that damaged dune. In addition, beach and dune vegetation provides critical food, nesting sites, and protective cover for various types of wildlife.

The vegetation communities found in undisturbed beach and dune environments exhibit a characteristic pattern of zonation in response to an environmental gradient of the frequency of tidal inundation and severity of wind-blown salt and sand. The floral species most tolerant of tidal inundation and salt spray are located on the open beach and foredune; whereas, the more sheltered dune swales and secondary dunes are colonized by the less tolerant plant species. Plant species commonly found seaward of the primary dune and on the foredune in the project areas include American beachgrass, beach pea (*Lathyrus maritimus*), dusty miller (*Artemisia stelleriana*), seaside goldenrod (*Solidago sempervirens*), common saltwort (*Salsola kali*), seaside spurge (*Euphorbia polygonifolia*), and sea rocket (*Cakile edentula*). In addition, the open beach and foredunes are the preferred habitat for two species of special concern, seabeach amaranth (*Amaranthus pumilus*) and seabeach knotweed (*Polygonum glaucum*). Seabeach amaranth is designated as federally threatened, and seabeach knotweed is listed as a New York State rare plant species. Seabeach amaranth is an often inconspicuous annual plant with fleshy stems and leaves. It grows prostrate to the sand surface and forms mats of branched stems up to 0.4 meters in diameter. Seabeach knotweed also grows prostrate to the substrate, presumably this growth pattern allows these plants to avoid damage by wind-blown salt and sand that would cause the plants to lose precious moisture. Seabeach knotweed is occasionally found on sandy beaches, brackish swales, and the edge of salt marshes and can be most common in beach overwash situations.

On the leeward side of the primary dune and the swale, one would expect to find the aforementioned species, as well as less salt-tolerant woody vegetation including beach plum (*Prunus maritima*), northern bayberry (*Myrica pensylvanica*), Virginia creeper (*Parthenocissus quinquefolia*), and poison ivy (*Rhus radicans*). Bearberry (*Arctostaphylos uva-ursi*) and beach-heather (*Hudsonia tomentosa*) may also be found in the swale or near secondary dunes. Further back in the island other vegetation communities may also be found including various bogs, maritime thickets/forest and salt marshes. Fire island bog areas are characterized by vegetation such as cranberry (*Vaccinium macrocarpon*), highbush blueberry(*Vaccinium corymbosum*), swamp azalea, (*Rhododendron viscosum*), narrow leaved cattail (*Typha angustifolia)* , wool grass (*Scirpus cyperinus*), common reed *(Phragmites australis*), swamp maple (Acer *rubrum*), sour gum (*Nyssa sylvatica*), sphagnum moss (*Sphagnum spp.),* sensitive/royal ferns, marsh St. Johnswort (*Hypericum virginicum*), red chokeberry (*Pyrus arbutifolia*), inkberry (*Ilex glabra*), smartweed (*Polygonum spp.*) and various species of sedge (*Carex* spp.), and rushes.

Shoreline Processes

Littoral processes include interactions among waves, currents, winds, tides, sediments, and other materials near the shoreline. Littoral currents generally run parallel to the shoreline (*e.g.*, longshore currents and rip currents) and, in association with waves, winds, and tides, transport coastal materials to and away from beaches. Such materials, collectively referred to as “littoral drift”, include sand, gravel, other sediments, and organic material. Littoral transport is the movement of littoral drift in the littoral zone by waves and currents. Depending on the rate and direction of littoral transport, beaches erode, accrete, or remain relatively stable (USACE, 1975).

Waves are the primary cause of sediment transport in the littoral zone and are the principal cause of most shoreline change (USACE 1975). A variety of factors influence the direction and energy of waves, including winds and water depth. In shallower waters, the energy of waves is dissipated through friction with bottom sediments and additional energy is lost as waves break on shorelines or other objects. In general, waves that approach shore through deeper water or channels retain greater energy that is spent in closer proximity to the shore. When greater energy is expended by waves in the littoral zone, erosive forces increase the transport of littoral drift.

Although prevailing currents in the project area generally run from east to west (Conley, 2000), sediments in the immediate vicinity are moved predominantly by wave action with storm winds typically blowing in a southwesterly direction. These factors create littoral currents that typically transport littoral drift to the west, although transport to the east also may occur. Therefore, any changes in the beach profile caused by any beach nourishment or alteration actions will represent a change, although temporary, to the shoreline littoral processes. The scope and scale of the beach alteration will determine the degree to which the littoral processes are affected both spatially and temporally.

Fire Island National Seashore has an unusual oblique East-West geographic orientation, differing from the usual east-facing beaches on the Atlantic Coast. This feature therefore results in different beach and dune responses to northeast coastal storms. FIIS south-facing shoreline responds to storms occurring well to the south, some of which can include offshore hurricanes bypassing the area without making landfall. More regionally centered storms also have erosional and flooding impacts on both oceanside and bayside beaches due to local wind-generated waves and ocean set-up.

Net sediment transport is from the east to the west on the ocean side. Until jettied in 1940 at the western extremity (Democrat Point), Fire Island was extending westward at 64 m/yr., although subsequent dredging of Fire Island Inlet is needed to maintain navigational safety. Estimates of the longshore transport rate converge at approximately 200,000 m^3/yr entering past Moriches Inlet but between 370,000 and 540,000 m^3/yr. into Fire Island Inlet. This increase in longshore transport rate cannot be balanced by shoreline losses so Kana (1995) attributed the excess to onshore transport from a presumed Fire Island Inlet ebb-tidal delta, which has been lost. Schwab *et al.* (2000) shows that, west of Watch Hill, onshore transport on the order of 200,000 m^3/yr. from the remnants of a Cretaceous age source. As a result of these natural and human actions, the island is becoming thinner on the western side and migrating landward on the eastern limb, according to the geological interpretation of Leatherman and Allen (1985).

Visual and Scenic Values

Fire Island is well-known for its picturesque beaches which are due, in part, to the presence of naturally occurring magnetite and garnet sands, which are transported along the shoreline with the littoral drift and show up as black and red/purple layers in the beach sand. These minerals are deposited and rearranged over time through wave and wind action. The contrast of the red and black sands against the white quartzose sands is a valued sight for visitors and residents alike.

Special Status Species

Federally listed wildlife species documented to occur on Fire Island National Seashore include the threatened piping plover *(Charadrius melodus)* and bald eagle (*Haliaeetus leucocephalus*) and the endangered roseate tern (*Sterna dougali*) and sea beach amaranth (*Amaranthus pumilus*). Protected sea turtles and marine mammals also occur in the waters along FIIS and are addressed here as well. A number of other species have the potential to occur on FIIS, such as the state endangered tern species addressed below. Input and comments were solicited from USFWS, NMFS, NYSDEC and NYNHP since the first scoping meeting in September 2002 (See Table 3).

The piping plover has been listed as a federally threatened species since 1986. Piping plovers arrive on Fire Island in March; egg laying and incubation occurs from April through June, with chicks typically hatching from May through August. The birds begin leaving Fire Island in August and are almost completely gone by September (NPS 2001b). Adult piping plovers returning to the national seashore in spring can be found almost anywhere along the beaches. Nesting in recent years occurs primarily on the beaches in front of the Otis Pike Wilderness Area. Plovers have been documented in other areas of the park sporadically over the past 7 to 10 years. Plovers generally forage on the beach, but also in dune swales or on the bay shore if there is access through the primary dunes for flightless chicks (NPS 2001b).

Based on piping plover sightings or nest location data (11 recorded points), all sightings have been on the Atlantic coast beaches except for one near the shore of Fire Island Inlet and one on the back bay shore near Old Inlet. Piping plover counts have been conducted on Long Island since 1985, with an average of 16 birds per year on Fire Island from 1985 to 1993 (ranging from a low of 4 to a high of 26), and an average number of 8.6 pairs from 1994 to 2000 (a low of 4 and a high of 17 pairs). Piping plover nesting productivity on Fire Island National Seashore has been low, with about 0.79 fledgling per pair since 1993 (NPS 2001b). In 2002 however, there were 10 nests and a productivity of 2.8 fledglings per pair. Most of the birds and nest occurrences have been recorded in the Wilderness Area and the Sunken Forest/Sailors Haven area, however several birds and nests have been located in or around communities like in front of Cherry Grove in 2002, another pair about a mile east in the Talisman area, and a pair near Water Island in 1997.

The federally threatened bald eagle is occasionally sighted in the national seashore (NPS 2001b). An average of two bald eagles were counted on the national seashore during fall migrations each year between 1986 and 1995 (NY Audubon Society 2002). The state endangered peregrine falcon occurs at Fire Island National Seashore during the fall migration. An average of 146 peregrine falcons were counted during fall migrations each year between 1986 and 1995 (NY Audubon Society 2002).

The northeast breeding population of roseate terns has been listed as endangered since 1987. The roseate tern is exclusively a coastal bird that breeds on small islands or occasionally on barrier beaches. It arrives in coastal areas around Fire Island in April, with egg-laying, incubation, and rearing of chicks from May through August. Most roseate terns leave the coastal areas around Fire

Island by the end of September. The only nesting colony within the national seashore is on West Inlet Island. Roseate tern nesting sites are always associated with common tern colonies in New York. Based on NYSDEC records, at one time as many as 200 pairs of roseate terns were documented on Fire Island. No pairs of roseate terns were documented on West Inlet Island between 1987 and 1996, and in 1996, 36 pairs of roseate terns were documented on West Inlet Island (NPS 2001b).

The common tern arrives on Fire Island in April and May and remains until September or October. It nests from late May through July, and most young are fledged by September. Common terns typically nest in sand, gravel, or seaweed along ocean and backbay beaches and on the small islands in the Great South Bay. Based on observations documented between 1985 and 1998, with the exception of a ternery at Long Cove, most breeding occurs on the small backbay islands within the national seashore. Common terns typically rest on beaches during and after foraging in the ocean and back bays (NPS 2001b). An average of 760 pairs of common terns per year were counted in the national seashore from 1985 through 1998. The Natural Heritage Program database indicates 11 common tern records: 2 points on the oceanside, 3 points on the bay beaches, and 6 points on smaller backbay islands including East Fire Island, West Fire Island, New Made Island, Sexton Island, and West Inlet Island. The most abundant terneries occur on New Made Island and West Inlet Island. Most breeding occurs on the small backbay islands. In most years observed (1985–1998), more than 98% of the tern pairs are found on the small islands in the Great South Bay. The only consistent ternery on Fire Island is at Long Cove (NPS 2001b).

The least tern arrives on Fire Island in April and remains through September. Egg laying, incubation, and rearing typically occur from May through August. Breeding habitat consists of flat, open sand, gravel, or dredge spoil with little vegetation. Nesting sites are typically associated with piping plover nesting sites (NPS 2001b). Least terns forage in the Great South Bay or on the ocean when the water is calm, with the most active foraging time in the early morning, and they commonly rest on beaches during and after foraging (NPS 2001b). An average of 40 pairs of least terns per year have been counted in the national seashore from 1994 through 1999, predominantly at Watch Hill and Long Cove.

Marine Mammals and Sea Turtles

Marine mammals and sea occur in the waters offshore of FIIS, with a potential of occurrence in the vicinity of the borrow area. Three species of whales—the finback (*Balaenoptera physalus*), hump-backed (*Megaptera novaeangliae*), and the right whale (*Balaena glacialis*) have the potential to pass through the waters above the borrow area. All three species are State and Federal endangered species. They are normally found significantly farther offshore, but have the (limited) potential to enter the area during spring and fall migration periods. Additional marine mammals include the harbor seal (*Phoca vitulina*) and hooded seal (*Cystophora cristata*), which have been observed utilizing the jetties at Shinnecock Inlet as a haul-out location. Neither species is currently considered to be endangered or threatened by either State or Federal agencies.

The New York Bight has one of the highest diversities of marine mammals in the United States. Two species of marine mammals occur year-round in the waters off Fire Island National Seashore. These resident species include the bottle-nosed dolphin (*Tursiops truncatus*) and the harbor seal. Transient marine mammals that occur regularly or in large numbers in the vicinity of the national seashore include the northern right whale, finback whale, Minke whale, (*Balaenoptera acutorostrata*) humpback whale, and beluga whale (*Delphinapterus leucas*). It should be noted that the occurrences of these mammals are largely confined to offshore waters. Harbor porpoise (*Phocoena phocoena*) have been sighted on rare occasion in the Great South Bay (USACE 1999).

Five species of sea turtles have been documented around Fire Island National Seashore, although none nest in the area. The loggerhead sea turtle (*Caretta caretta*) is federally threatened. The Kemp's Ridley (*Lepidochelys kempii*), leatherback turtle *(Dermochelys coriacea*), hawksbill turtle (*Eretmochelys imbricata*), and green sea turtles (*Chelonia mydas*) are federally endangered. Sea turtles occurring in nearshore waters are typically small juveniles; the most abundant is the loggerhead turtle, followed by the Kemp's ridley. The waters off Long Island are also warm enough to support green sea turtles from June through October. The leatherback turtle, which is the most commonly observed turtle from May through October offshore, utilizes the offshore areas and is not found in the estuaries or backbay areas. The hawksbill sea turtle rarely occurs in the area and is probably an anomalous visitor. Sea turtles begin arriving in the waters around Fire Island in June and July and remain for several weeks, using the shallow coastal waters to forage. Kemp's ridley and loggerheads feed primarily on benthic crustaceans, and green sea turtles feed primarily on eelgrass and algae. The leatherback sea turtle remains offshore of the barrier island and commonly feeds on jellyfish and ctenophores. All sea turtles in the area feed on submerged aquatic vegetation, including green fleece, sea lettuce, and eelgrass (USACE 1999). Sea turtles leave the area by late fall as water temperatures decrease.

Plant Species

The federally threatened seabeach amaranth (*Amaranthus pumilus*) occurs on overwash flats on the accreting ends of barrier islands, on lower foredunes of beaches, and on non-eroding beaches landward of the wrackline which is found along the high tide line. The plant also occurs on blowouts and on dredge spoils. Seabeach amaranth seems to be incapable of competing with other plants and is typically found in areas with little or no vegetation in early successional beach areas. There are six recorded locations of seabeach amaranth on Fire Island.

The largest concentrations of the plant have been recorded at Democrat Point and Smith Point (NPS 2001b).

Table 3. Special status species of potential concern in the project area.

Common Name (*Scientific Name*)	**Status***	**Documented in Action Area**	**Presence in Action Area**
iping plover (*Charadrius melodus*)	FT, SE	Yes	Have been documented nesting and foraging at more locations in park in recent years. Nesting plovers have been observed on ocean-side beaches near and in front of communities including Cherry Grove, Fire Island Pines, and the western communities, see Figure 2 below (color version on page 146). Plovers typically begin arriving at the park in mid-March where they commonly nest on beaches, foredunes, and overwash areas from mid-April through July. Adult and juvenile plovers feed on oceanside beaches near the tide line and in shallow, near-shore areas of Great South Bay. Adults and fledged offspring typically have left the park by early September.
Roseate tern (*Sterna dougallii*)	FE, SE	No	Have been infrequently/sporadically observed foraging but not nesting at the park. Roseate terns typically begin arriving in New York in late April where they nest on sandy, shelly, or gravely beaches. Historically, they have nested on islands within FIIS boundaries, but not on Fire Island itself (NPS 2003a unpublished). Adults and fledged offspring begin leaving New York in late August or early September.
Least tern (*Sterna antillarum*)	SE	Yes	Have been documented nesting and foraging at several locations in the park, including Sunken Forest and Watch Hill. Least terns typically begin arriving at the park in late April where they nest on sandy beaches or offshore islands. Adults and fledged offspring begin leaving the park in late August or early September.

Common Name (***Scientific Name***)	Status*	Documented in Action Area	Presence in Action Area
Common tern (*Sterna hirundo*)	ST	Yes	Have been documented nesting and foraging at several locations in the park, including Sunken Forest and Long Cove. Common terns typically begin arriving at the park in late April where they nest on sandy, gravely, or shelly beaches or offshore islands. Adults and fledged offspring begin leaving the park in late August or early September.
Finback whale (*Balaenoptera physalus*)	FE, SE	No	Have been documented in the waters offshore of FIIS year-round. They are usually found in waters farther offshore, but have the potential to pass through the waters above the borrow area. Most abundant during the spring and summer.
Humpback whale (*Megaptera novaeangliae*)	FE, SE	No	Have been documented in the waters offshore of FIIS. They are usually found in waters farther offshore, but have the potential to pass through the waters above the borrow area during spring and fall migration periods.
Right whale (*Balaena glacialis*)	FE, SE	No	Have been documented in the waters offshore of FIIS. They are usually found in waters farther offshore, but have the potential to pass through the waters above the borrow area during spring and fall migration periods.
Green sea turtle (*Chelonia mydas*)	FT, ST	No	Green sea turtles nest on tropical and subtropical beaches south of New England. Adult and juvenile turtles range widely into New York waters from June to October where they forage on seagrass, algae, and invertebrates in inlets, bays, and estuaries. When water temperature drops below 18 degrees Celsius (64 degrees Fahrenheit), turtles begin their southward migration to warmer areas.
Loggerhead sea turtle (*Caretta caretta*)	FT, ST	No	Loggerhead sea turtles nest predominately on Florida beaches or other areas south of New England. Adult and juvenile turtles range widely into New York waters from June to October where they forage on seagrass, algae, and invertebrates in inlets, bays, and estuaries. When water temperature drops below 18 degrees Celsius (64 degrees Fahrenheit), turtles begin their southward migration to warmer areas.

Common Name (***Scientific Name***)	Status*	Documented in Action Area	Presence in Action Area
Kemp's ridley sea turtle (*Lepidochelys kempii*)	FE, SE	No	Kemp's ridley sea turtles nest only on a single beach in Tamaulipas, Mexico. Adult and juvenile turtles range widely into New York waters from June to October where they forage on seagrass, algae, and invertebrates in inlets, bays, and estuaries. When water temperature drops below 18 degrees Celsius (64 degrees Fahrenheit), turtles begin their southward migration to warmer areas.
Seabeach amaranth (*Amaranthus pumilus*)	FE, SE	Yes	Has been documented at several locations in the park, including lower foredunes and oceanside beaches in the action area.
Seabeach knotweed (*Polygonum glaucum*)	SC	Yes	Has been documented at several locations in the park, including lower foredunes and oceanside beaches in the action area.

*FE = federally endangered
*FT = federally threatened

*SE = State endangered
*ST = State threatened
*SC= State species of special concern

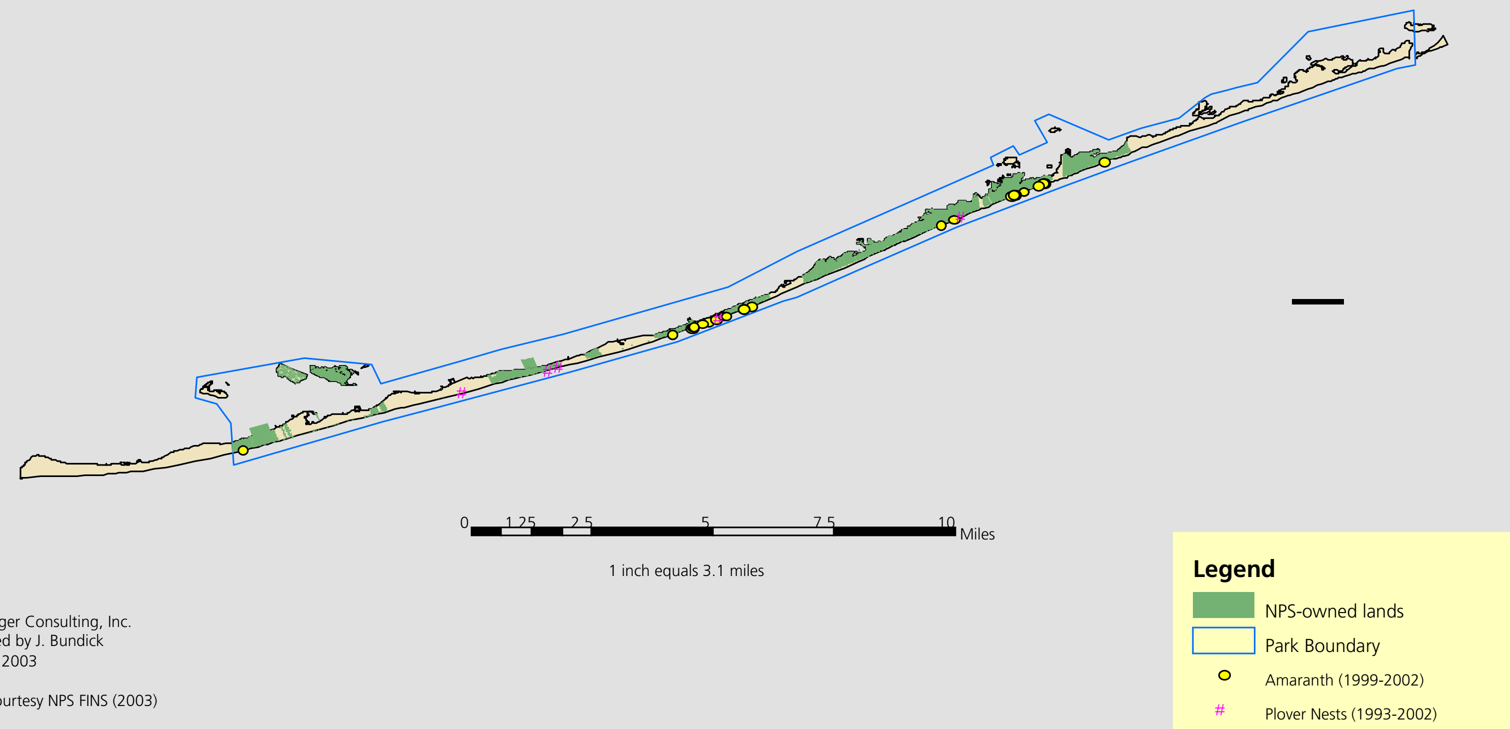
Essential Fish Habitat for Finfish

More than 150 species of fish occur in the waters of Fire Island National Seashore. Many finfish species use the estuarine waters for spawning, young-of-year and nursery habitat, seasonal feeding grounds, and general living space. Common resident fish include mummichog (*Fundulus heteroclitus*), Atlantic silverside (*Menidia menidia*), striped killifish (*Fundulus majalis*), northern pipefish (*Syngnathus fuscus*), sheepshead minnow (*Cyprinodon variegatus*), threespine stickleback (*Gasterosteus aculeatus*), and fourspine stickleback (*Apeltes quadracus*), striped anchovy (*Anchoa hepsetus*), and bay anchovy (*Anchoa mitchilli*). The estuary is an essential nursery habitat for commercially, recreationally, and ecologically important species, including summer flounder (*Paralichthys dentatus*), blackfish (*Tautoga onitis*), black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), striped bass (*Morone saxatilis*), Atlantic menhaden (*Brevoortia tyrannus*), butterfish (*Peprilus triacanthus*), and *scup (Stenotomus chrysops*). Resident fishes, especially the abundant bay anchovy and silversides, are prey species for most piscivorous fish and birds, and rely on the estuary for spawning and nursery areas. Other resident fish using the estuary as spawning and nursery habitats include mummichog, striped killifish, sticklebacks, naked goby (*Gobiosoma bosci*), grubby (*Myoxocephalus aenaeus*), longhorn sculpin (*Myoxocephalus octodecimspinosus*), shorthorn sculpin (*Myoxocephalus scorpius*), pipefish (*Syngnathus sp.*), winter flounder (*Pleuronectes americanus*), white perch (*Morone americanus*), tomcod (*Microgadus tomcod*), weakfish (*Cynoscion regalis*), blackfish, cunner (*Tautogolabrus adspersus*), northern puffer (*Sphoeroides maculatus*), sheepshead minnow, hogchoker (*Trinectes maculatus*), and oyster toadfish

(*Opsanus tau*) (NYS DOS 1998b). The surf zone supports abundant numbers of northern puffer, northern kingfish (*Menticirrhus saxatilus*), striped bass, bluefish, weakfish, and summer flounder from April through November. Blueback herring (*Alosa aestivalus*), hickory shad (Alosa mediocris), *alewife (Alosa pseudoharengus*), American shad (*Alosa sapidissima*), and butterfish are also abundant in the surf (USACE 1999).

Figure 2. Piping Plover and Sea Beach Amaranth on Fire Island National Seashore

** Plover data from 1993-2002 and Amaranth data from 1999-2002*



Terwilliger Consulting, Inc.
Prepared by J. Bundick
May 5, 2003

Data courtesy NPS FINS (2003)

Pursuant to the Magnuson Stevens Act amendments of 1996, the National Marine Fisheries Service (NMFS) in coordination with NOAA and the Mid Atlantic Fisheries Management Council (MAFMC) have identified and proposed for federal designation the most significant and imperiled areas for marine organisms as "Essential Fish Habitats" (EFHs). This designation helps to focus protection and habitat enhancement strategies in all future fishery management plans.

On April 29, 1999, the Secretary of Congress approved these EFHs, thereby officially designating all mapped areas as shown in the 1998 proposed Amendments to the Fishery Management Plans developed by the Magnuson-Stevens Fishery Conservation and Management Act (MSFMC). Pursuant to the 1996 Amendments to MAFMC, such designation requires that all federal agencies consult with the National Marine Fisheries Service (NMFS) on any federal actions that may potentially adversely impact an EFH.

Essential Fish Habitats include "those waters and substrates necessary to fish for spawning, breeding, feeding or growth to maturity." Several of the Fishery Management Plans have recently been completed. The available Plans were reviewed to determine whether the study area lies within or contiguous to any area proposed for designation as an EFH, and what management recommendations were included. The Summer Flounder, Scup and Black Sea Bass Fishery Management Plan (MSFMC et. al., October 1998) identified SAV and macroalgae beds as Habitat Areas of Particular Concern (HAPC) for summer flounder, because of their ecological importance as feeding habitat and shelter from predators. The Plan further defines the proposed HAPC designation as "all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations within the adult and juvenile summer flounder EFH" as HAPC. A breach or significant overwash resulting from the No-Build scenario could threaten current SAV and eelgrass beds, thereby potentially impacting summer flounder (as well as other marine organisms that are dependant upon this habitat type).

According to information provided by the National Marine Fisheries Service (NMFS) and obtained from the NMFS's Northeast Region Internet site (http://www.nero.nmfs.gov/ro/doc/hcd.htm), the waters of Great South Bay in the project area have been designated as "essential fish habitat" for 15 species of managed fish. Essential fish habitat comprises "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity."

The project area is located within the following geographic area:

Great South Bay, New York: 10' x 10' latitude and longitude squares included in this bay or estuary or river (southeast corner boundaries): 4050/7220; 4050/7230; 4040/7230; 4040/7240; 4040/7250; 4040/ 7300; 4040/7310; 4040/7320; 4030/7300; 4030/7310; 4030/7320; 4030/7330; 4040/7340

Essential habitat for the following fish species, including life-history stage of concern, has been designated within the project-area square:

Table 4. Species for which an essential fish habitat (EFH) has been designated by the National Marine Fisheries Service.

Species	Eggs	Larvae	Juveniles	Adults
American plaice (*Hippoglossoides platessoides*)				
Atlantic butterfish (*Peprilus triacanthus*)	X	X	X	X
Atlantic cod (*Gadus morhua*)				
Atlantic mackerel (*Scomber scombrus*)	X	X	X	X
Atlantic salmon (*Salmo salar*)				X
Atlantic herring (*Clupea harengus*)			X	X
Atlantic sea scallop (*Placopecten magellanicus*)				
Black sea bass (*Centropristus striata*)	N/A	X	X	X
Bluefin tuna (*Thunnus thynnus*)			X	X
Bluefish (*Pomatomus saltatrix*)			X	X
Blue shark (*Prionace glauca*)		X	X	X
Cobia (*Rachycentron canadum*)	X	X	X	X
Common thresher shark (*Alopius vulpinus*)		X	X	X
Dusky shark (*Carcharhinus obscurus*)		X	X	
Haddock (*Melanogrammus aeglefinus*)				
King mackerel (*Scomberomorus cavalla*)	X	X	X	X
Long-finned squid (*Loligo pealei*)	N/A	N/A	X	
Monkfish (*Lophius americanus*)	X	X		
Ocean pout (*Macrozoarces americanus*)	X	X		X
Pollack (*Pollachius virens*)			X	
Redfish (*Sebastes fasciatus*)	N/A			
Red hake (*Urophycis chuss*)	X	X	X	
Sand tiger shark (*Odontaspis taurus*)		X		
Sandbar shark (*Carcharhinus plumbeus*)		X	X	X
Scup (*Stenotomus chrysops*)	N/A	N/A	X	X

Species	Eggs	Larvae	Juveniles	Adults
Shortfin mako shark (*Isurus oxyrinchus*)		X	X	X
Skipjack tuna (*Euthynnus pelamis*)				X
Spanish mackerel (*Scomberomorus maculates*)	X	X	X	X
Spiny dogfish (*Squalus acanthias*)	N/A	N/A		
Summer flounder (*Paralicthys dentatus*)		X	X	X
Tiger shark (*Galeocerdo cuvieri*)		X	X	
Tilefish (*Lopholatilus chamaeleonticeps*)				
White hake (*Urophycis tenuis*)				
White shark (*Charcharodon carcharius*)			X	
Whiting (*Meriuccius bilinearis*)	X	X	X	
Windowpane flounder (*Scopthalmus aquosus*)	X	X	X	X
Winter flounder (*Pleuronectes americanus*)	X	X	X	X
Witch flounder (*Glyptocephalus cynoglossus*)				
Yellowtail flounder (*Limanda ferruginea*)	X			X
Quahog (*Mercenaria mercenaria*)	N/A	N/A	X	X
Surf Clam (*Spisula solidissima*)	N/A	N/A	X	X

Of the species listed above, only bluefish and summer flounder were discovered during aquatic sampling conducted in the project-area vicinity (Raposa and Oviatt, 1997).

Although habitat requirements vary by species, the eggs, larvae, and juveniles of species listed above generally require muddy, sandy, or rocky bottom substrates similar to those present in the project area. However, several species, including flounder and pollock, prefer areas that support aquatic vegetation, a habitat that also is present in the project vicinity. With a few exceptions (*e.g.*, bluefish and flounder), adults and juveniles of the above-listed species commonly inhabit offshore waters along the continental shelf and would not inhabit the project area.

Vegetation/ Wetland Habitats

The park supports a variety of vegetative communities and habitats including beaches, sand dunes, wetlands, grasslands, shrublands, woodlands, and developed areas. Topographic characteristics of the barrier island result in the development of characteristic zonation in vegetative communities from the ocean shore to the backbay mudflats. The zonation in vegetative communities occurs, in part, as a result of salt spray, sand deposition, wind flow, cyclic littoral erosion, and human and meteorological disturbances. The zonation in vegetative communities is more prevalent in areas where the primary and secondary dunes are well developed. Plants growing on primary dunes must be able to withstand high intensities of salt spray and survive periodic burial by sand. Woody shrubs will typically dominate the more stable secondary dunes and swales

Maritime forest communities are found leeward of the secondary dune system, and salt marsh communities will typically be found bayward of the maritime forest community. This zonation is not contiguous across Fire Island National Seashore but is found extensively throughout the area (ACOE 1999). Some areas along the seashore have lost sections of the primary and secondary dune systems to shoreline change. The majority of the coastal beach lacks vegetation. Where vegetation occurs, it is characterized by common saltwort (*Salsola kali*), seaside *spurge (Euphorbia polygonifolia*), and sea rocket (*Cakile edentula*). Vegetation on the oceanside of the primary dunes is typically dominated by American beach grass (*Ammophila breviligulata)* with limited amounts of dusty miller (*Artemisia stelleriana*) and beach pea (*Lathyrus maritimus*). The leeward sides of primary dunes, which are relatively undisturbed, are characterized by beachgrass, beach plum (*Prunus maritima)*, bayberry (*Myrcia pensylvanica*), Virginia creeper (*Parthenocissus quinquefolia*), and poison ivy (*Toxicodendron radicans*). Bearberry (*Arctostaphylos uva-ursi*) and beach heather (*Hudsonia tomentosa*) occur in the dune and swale community. The landward side of the secondary dune system is dominated by woody shrubs and tree species, including black cherry (*Prunus serotina*), pitch pine (*Pinus rigida*), eastern red cedar (*Juniperus virginiana*), winged sumac (*Rhus copallina*), highbush blueberry (*Vaccinium corymbosum*), and American holly (*Ilex opaca*) (ACOE 1999). Trees in the maritime forest are characterized by eastern red cedar, pitch pine, winged sumac, black cherry, American holly, and sassafras (*Sassafras albidum*). Shrubs include highbush blueberry, serviceberry (*Amelanchier canadensis*), and red chokeberry (*Aronia arbutifolia*) with some elderberry (*Sambucus canadensis*) and arrow-wood (*Viburnum dentatum*). Herbaceous vegetation includes poison ivy, wild sarsaparilla (*Aralia nudicaulis*), Virginia creeper, Canada mayflower (*Maianthemum canadense*), and false Solomon's seal (*Smilacina racemosa*)(USACE 1999). Salt marsh and tidal flat habitats occur along the backbay shoreline between the Fire Island Inlet and Moriches Inlet. Tidal wetland habitats are common along the backbay of the national seashore from the western boundary of the Otis Pike Wilderness Area east to the Moriches Inlet, around East Fire Island, and along the shoreline of the William Floyd Estate. Maps prepared by the New York State Department of State, Division of Coastal Resources, show tidal wetlands in the South Shore Estuary Reserve, which includes Fire Island National Seashore.

The most common type of salt marshes occurring in this area formed on overwash fans along back barriers and flood tidal deltas. The salt marsh and tidal flat habitats can be divided into three zones, including the supratidal zone, intertidal zone, and subtidal zone. The supratidal zone occurs above the normal high tide level but is dissected by tidal channels and inundated during extreme high tides. The zone is typically flooded bimonthly by spring tides and irregularly by storm tides. Dominant vegetation occurring in the high tidal marsh habitat includes stands of salt meadow cordgrass (*Spartina patens*), groundsel tree (*Baccharis halimifolia*), seaside goldenrod (*Solidago sempervirens*), bayberry, sea lavender (*Limonium carolinianum*), spike grass (*Distichlis spicata*), blackgrass (*Alopecurus myosuroides*), and glasswort (*Salicornia virginica*) (USACE 1999). The intertidal zone occurs between the high and low tide levels and, depending on wind and tide conditions, is flooded once or twice per day. Vegetation in the lower salt marsh habitats is dominated by salt marsh cordgrass (*Spartina alterniflora*). The subtidal flat lies below the mean low tide level and is inundated most of the time. The subtidal flat is typically characterized by macroalgae, including sea lettuce (*Ulva lactuca*), rockweed (*Fucus vesiculosus*), green fleece (*Codium fragile*), hollow green weed (*Enteromorpha compressa*), Irish moss (*Chondrus crispus*), graceful red weed (*Gracilaria foliifera*), Agardh's red *weed (Agardhiella tenera*), false agardhiella (*Gracilaria verrnucosa*), and banded weeds (USACE 1999).

Submerged Aquatic Vegetation

Submerged aquatic vegetation (SAV) is a diverse assemblage of rooted macrophytes that grow in shallow water, under the surface, but not above it. Under federal regulations SAV beds are considered special aquatic sites (40 CFR 230). These plants are beneficial to aquatic ecosystems because they provide protective habitat for young and adult fish and shellfish, as well as food for waterfowl, fish, and mammals. They also aid oxygen production, absorb wave energy and nutrients, and improve the clarity of the water. In addition, SAV beds stabilize bottom sediments and suspended sediments present in the water. Seagrass meadows dominated by eelgrass (*Zostera marina*) are abundant from Fire Island Inlet to Moriches Inlet. Large meadows of eelgrass have been identified in extensive shallow flats adjacent to the Otis Pike Wilderness Area. In most areas, the eelgrass is separated from the shoreline by narrow bands of unvegetated substrate. In more quiescent areas widgeon grass (*Ruppia maritima*) occurs in the narrow bands that separate the eelgrass from the shoreline (USACE 1999). Several animals of commercial importance are abundant in eelgrass meadows and depend on the habitat for both nursery and adult habitat. Winter flounder (*Pleuronectes americanus*) use the eelgrass meadows for nursery habitat, and larvae of sea scallops (*Placopecten magellanicus*) depend on the dense grasses for protection from predators. In 1997 NPS staff observed 13 species of fish and 4 species of decopods in throw trap samples collected from eelgrass beds in Great South Bay (USACE 1999).

Wildlife and Wildlife Habitat

Mammals

Seventeen species of terrestrial mammals were identified on Fire Island during surveys conducted by McCormick in 1974. Common species identified in the survey include white-tailed deer (*Odocoileus viginianus*), eastern cottontail (*Sylvilagus floridanus*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), masked shrew (*Sorex cinereus*), short-tailed shrew (*Blarina brevicauda*), muskrat (*Ondatra zibethica*), weasel (*Mustela* spp.), white-footed mouse (*Peromyscus leucopus*), and Norway rat (*Rattus norvegicus*). The little brown bat (*Myotis lucifugus*) is the most common bat observed in the area. Feral cats and dogs are also present (U.S. Army Corps of Engineers [ACOE] 1999).

Amphibians and Reptiles

Eight reptile and two amphibian species occur on Fire Island National Seashore. Fowler's toad (*Bufo woodhousei*)and the bullfrog (*Rana catesbeiana*) are the only identified amphibian species. Reptiles identified include eastern mud turtle (*Kinosternon subrubrum subrubrum*), spotted turtle (*Clemmys guttata*), northern diamondback terrapin (*Malaclemys terrapin terrapin*), snapping turtle (*Chelydra serpentina*), eastern box turtle (*Terrapene carolina*), eastern garter snake (*Thamnophis sirtalis*), and northern black racer (*Coluber constrictor constrictor*) (USACE 1999).

Northern diamondback terrapins are common on the backbay sides of the barrier islands. The turtles forage in tidal creeks of marshes and in the open bays. The northern diamondback terrapin feeds on marine snails, clams, and worms. The species typically comes ashore along the bay in June to lay eggs, which hatch in late summer (USACE 1999).

Birds

More than 330 species of birds have been identified on Fire Island National Seashore (see Table 7 for the most common). Fire Island is located along the Atlantic flyway for shorebirds, waterfowl, and other birds that nest in the north and migrate south for the winter. The salt marshes, beaches, and dunes on the island are nesting places for various species of plovers (*Charadrius* spp.), gulls (*Larus* spp.), terns (*Sterna* spp.), geese (*Branta* spp.), herons (*Ardea* spp.), and ducks (*Anas* spp.). The American oystercatcher (*Haematopus palliatus*) and black skimmer (*Rynchops niger*) are two migratory species that are known to breed in the salt marshes and barrier beaches of Fire Island. The federally threatened piping plover (*Charadrius melodus*) and the New York threatened least tern (*Sterna antillarum*) also nest on the island.

Soundscapes

Ambient noise levels in the proposed project area are highly variable. Wind and surf create a natural background condition that occurs year-round, with levels dependent on the severity of weather conditions. Human activities, both on the water and in the upland portion of the community, also are a key contributor to local noise levels. The levels of human-induced noise are strongly seasonal, generally attaining maximum values during the summertime when residents and visitors are present in the greatest numbers, and being significantly reduced during the winter off-season when the population of Fire Island is substantially lower. Some of the primary factors in the levels of human-induced noise in the project area include vessel operations in adjoining waters, human voices, electronic audio equipment, construction activities, activities in the community's commercial district, motor vehicles, and the like. The passage of aircraft creates periodic spikes in noise levels. Overall, ambient noise levels on Fire Island generally are relatively low compared to communities on the Long Island mainland. Under the proposed alternatives, the main cause of noise during the placement of sand is the operation of the bulldozers. This source is short-term and no long-term noise impacts would occur.

Human Environment

Recreation and Public Use

Fire Island National Seashore visitor centers report an average of 600,000 visitors using the visitor centers each year. The number of recreational visits to the Park have increased since 1995 and are expected to reach over 700,000 in 2003. However, significant additional visitation is made by the summer visitors and residents to the 17 private communities, making a more realistic estimate of annual recreational use at over 3 million visitors each year. FIIS provides visitors an abundance of recreational land and water activities. Since it is one of the largest public beaches closest to New York City, it provides beach access and recreation to this large metropolitan population.

Each of Fire Island's communities has a beach for bay or ocean swimming, and sometimes both. Thirteen communities have lifeguard-protected beaches on the ocean and seven have bayside lifeguard protection. Generally, the bayside beaches are roped-off swimming areas near the town's marina or dock; therefore, these areas tend to attract families with children. In Saltaire and Ocean Beach, the beach areas are next to the village parks, bay beaches, and commercial areas. Here year round residents are estimated at around 400, while summer residents increases to almost 20,000. Usage of the island shows even more dramatic change between the seasons due to the recreational access points located throughout the National Seashore.

Other than swimming, popular water sports include surfing, sea kayaking, windsurfing, water-skiing, canoeing, fishing, camping, hiking, birdwatching, clamming and sailing. According to FIIS visitor satisfaction feedback, visitors scored FIIS between 80-90% satisfaction rate.

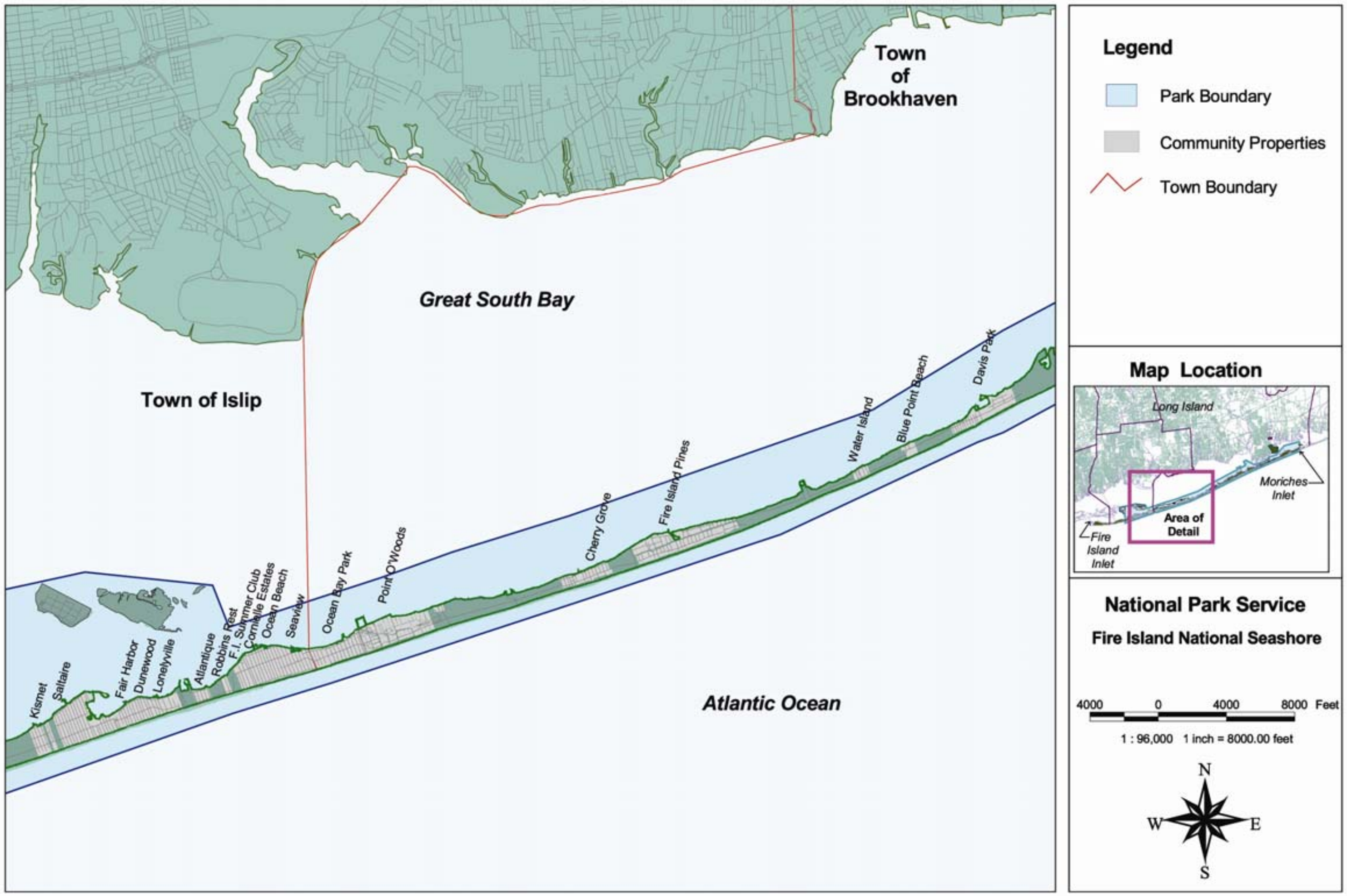
Local sport fishing in the Great South Bay and Atlantic Ocean is an activity for which the area is well known, and the project area features a wide array of fish species plus shellfish and crabs, each of which has a designated prime season. In 1997, FIIS registered 1,430 recreational permits for fishing and clamming in the Otis G. Pike Wilderness Area alone. In addition, several local charter companies and headboats on Captree Island and the mainland offer deep-sea fishing excursions into the Atlantic.

Fire Island has a variety of land sports facilities, such as tennis courts and softball fields. Bicycles are commonly used for access and recreation. Along with the option of riding along the beach, bicyclists can use the concrete or sand paths connecting the communities. Bicycles are available for rental at local markets and hardware stores. Runners and walkers are provided with many opportunities for activity by the miles of beach, inland paths and boardwalks. Each residential community is generally self-sufficient regarding recreation. The convenience of local facilities suggests that residents rarely use the adjacent federal facilities. Following is a description of each public recreation area, and the facilities included in each.

Robert Moses State Park, at the west end of the island, has public beaches, picnic areas, comfort stations, and concessions (see Figure 1). Full lifeguard protection is provided in the summer season, and fishing areas are designated outside the swimming area. Within the Fire Island National Seashore, three major recreational areas are open to the public: Sailors Haven, Watch Hill, and Smith Point. Sailors Haven is the site of the Sunken Forest, a 300-year-old preserve, which features an elevated boardwalk for public access. Sailors Haven has a 47-slip marina, snack bar, and souvenir shop. Picnic facilities and lifeguard protection are also provided. Watch Hill is the largest FIIS site, featuring a 183-slip marina, restaurant, grocery, and souvenir shop. Along with lifeguard protection on its oceanside beach, Watch Hill has 25 camping facilities open from May through October. Along with these major recreational areas, a small public facility with a picnic area and restrooms exists at Talisman, the island's most narrow point.

The Otis G. Pike Wilderness Area is located east of Watch Hill. Congress established the area in 1980 (see Figure 1). Within this wilderness are several ecosystems through which visitors hike, canoe, kayak and camp. Backcountry hikers and campers register at the Watch Hill visitor center. Smith Point County Park is to the east of the Otis G. Pike Wilderness Area and is technically within the boundaries of FIIS, but is managed by the Suffolk County Parks Department. The 6-mile-long park has public beach access, a visitor center, and camping facilities for 75 vehicles. Most of the recreational areas are found in the vicinity of the terminus of William Floyd Parkway.

Short Term Community Response to Storm Surges
Figure 1 - Location Map



Plot date: May 2, 2003 c:\arcview data\fiis\d_projects\fire island miscellaneous.apr

The Town of Islip manages several parks on Fire Island exclusively for its residents' use. Atlantique Town Beach offers many amenities such as a 157-slip public marina, restrooms, grill area, basketball court, handball court, and playgrounds. Until recently, the Town also managed Barrett Beach, a facility near Talisman with a marina, playground, and picnic facilities. In 1998, the title for this property was transferred to NPS. The Town of Brookhaven manages two public beaches, Leja Beach in Davis Park and Great Gun Beach in Smith Point County Park. Leja Beach has a public marina, picnic area, swimming beach, and playground. Great Gun Beach has a lifeguard-protected swimming area, playgrounds, and restrooms. The municipality of Bellport manages a beach within the Otis G. Pike Wilderness Area exclusively for its residents. The area has a private dock, visitor center/concession building, and oceanfront picnic deck. The Bellport ferry, a service exclusively for Bellport residents, provides access to Bellport Beach.

Cultural and Archeological Resources
Based on recent cultural resource investigations by Watts (2001), John Milner & Associates (2000 & 1998), Tuttle (1999), and others, there are no known cultural resources located in the dunes, beach, or nearshore within the project areas. Potential for resources in offshore areas may be higher than on the beach. Historical research confirmed that the coastal waters of New York have been an important center for maritime activity since colonial times (Watts, 2001). Shipwrecks along Fire Island date back to the mid-1600s and have become a source of cultural interest and merit, and one potential shipwreck has been found in or near the project area during recent investigations in one of the communities.

Socioeconomic Environment
Fire Island has a seasonal economy that extends from April and October, but its peak economic activity occurs during the summer months of June, July, and August. The seasonal nature of Fire Island is evident in the island's year-round population of 409 individuals, compared with its significantly larger seasonal population of approximately 19,450 individuals (Long Island Regional Planning Board [LIRPB], 1990)

The retail sector comprises the majority of economic activity, accounting for more than three-quarters of employment. Key businesses in the retail sector include restaurants, grocery stores, and liquor stores. These types of businesses are important to the local economy, given that Fire Island has a high proportion of seasonal renters and second-home owners whose objective is to enjoy the island's recreational and vacation resources. In addition, there is limited access to the bay shore of Long Island, which creates a more captive market and greater demand for convenient goods and services. Overall, it is estimated that there are approximately 135 businesses on Fire Island itself, and that these businesses account for about 800 jobs, many of which are seasonal. These estimates do not include the government concessions operating at Robert Moses State Park, Sailors Haven, and Watch Hill Visitors' Centers, and Smith Point County Park.

The concessions account for an additional 75 jobs, bringing total employment on Fire Island to approximately 875 jobs.

Economic activity on Fire Island largely centers around the ferry terminals and marinas on the island, because these are the access points for residents and day visitors. Businesses tend to be located on the bay side of Fire Island, and along the primary routes from the bay to the ocean beaches, *e.g.*, Broadway in Saltaire and Harbor Walk in Fire Island Pines. Some service sector businesses operate out of home offices, including real estate offices, accounting services, and desktop publishing.

Air Quality
Pollutant emissions, particularly nitrogen oxides and volatile organic compounds from vehicles and other dredging equipment, may adversely affect air quality, but only on a temporary basis. These compounds react with sunlight to form ozone. Fire Island National Seashore is in an area classified by the Environmental Protection Agency as severe non-attainment for ozone. The attached record of non-applicability for Section 176 of the Clean Air Act is attached, Appendix 1.

ENVIRONMENTAL CONSEQUENCES/IMPACTS

General Methodology For Establishing Impact Thresholds And Measuring Effects

General Definitions
The following definitions were used to evaluate the context, intensity, duration, and cumulative nature of impacts associated with project alternatives:

Context is the setting within which an impact is analyzed, such as society as a whole, the affected region, the affected interests, and/or a locality. In this EA, the intensity of impacts generally are evaluated within a local (i.e., project area) context, while the contribution of impacts to cumulative effects are analyzed in a regional context or, in the case of special status species, within the context of a species distribution.

Intensity is a measure of the severity of an impact. The intensity of an impact may be:

negligible, when the impact is localized and at the lower levels of detection. (For cultural resources when the impact is barely perceptible and not measurable; confined to small areas or a single contributing element of a larger National Register district or archeological site(s) with low data potential.)

minor, when the impact is localized and slight but detectable. (For cultural resources, impact is perceptible and measurable; remains localized and confined to a single contributing element of a larger National Register district or archeological site(s) with low to moderate data potential.)

moderate, when the impact is readily apparent and appreciable. (For cultural resources, impact is sufficient to cause a change in character-defining feature; generally involves a single or small group of contributing elements or archeological site(s) with moderate to high data potential.); or

major, when the impact is severely adverse and highly noticeable. (For cultural resources, impact results in substantial and highly noticeable change in character-defining features; involves a large groups of contributing elements and/or individually significant property or archeological site(s) with high to exceptional data potential.)

Duration is a measure of the time period over which the effects of an impact persist. The duration of impacts analyzed in this EA may be: *short term*, when impacts occur during construction or last one year or less; or *long term,* when impacts last one year or longer.

Cumulative Impacts are impacts on the environment that results from the incremental (i.e., additive) impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of who undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Cumulative impacts analyzed in this EA consider the effects of the various alternatives that may be undertaken by the communities after they have been approved and permitted by FIIS. This includes a scenario where all projects that are proposed in this EA will be pursued by the communities and thus a maximum amount of activity allowed by the NPS would be reached and subsequent applications would then be denied by FIIS.

Special Status Species Analyses

In accordance with language used to determine effects on threatened and endangered species under the federal Endangered Species Act (FWS, 1998), potential effects on special status species were categorized as follows:

- *no effect*, when the proposed actions would not affect special status species or critical habitat;

- *not likely to adversely affect*, when effects on special status species are discountable (*i.e.*, extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated) or completely beneficial; or

- *likely to adversely affect*, when any adverse effect to listed species may occur as a direct or indirect result of proposed actions and the effect is not discountable or completely beneficial.

Remaining considerations concerning special status species, including conclusions and evaluation of cumulative impacts, are presented in accordance with the general definitions described above under “General Definitions”. As described in impact sections, a determination of “likely to adversely affect” does not necessarily constitute a “major” or “moderate” adverse impact to a species.

IMPAIRMENT ANALYSIS

The NPS *Management Policies 2001* require an analysis of potential effects to determine whether or not actions would impair park resources. The fundamental purpose of the national park system, as established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within a park system unit, that discretion is limited by the statutory requirement that the agency must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise.

The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values. An impact to any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;

- key to the natural or cultural integrity of the park; or

- identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the park. The following process was used to determine whether the various alternatives had the potential to impair park resources and values:

> 1. The park's enabling legislation, the *General Management Plan,* the *Strategic Plan,* and other relevant background were reviewed to ascertain the park's purpose and significance, resource values, and resource management goals or desired future conditions.
>
> 2. Beach and shoreline management objectives specific to resource protection goals at the park were identified.
>
> 3. Baselines have been established for each resource of concern to determine the context, intensity and duration of impacts, as defined above.
>
> 4. An analysis was conducted to determine if the magnitude of impact reached the level of "impairment," as defined by the NPS *Management Policies.*

The impact analysis includes any findings of impairment to park resources and values for each of the management alternatives.

IMPACT ANALYSIS

Table 5 summarizes the potential impacts of each of the alternatives on the affected environments described above.

Natural Resources

Marine Resources

Offshore Environment/ Borrow Area

Alternative A, No action Impacts

Under the no Action alternative, no impacts are expected to the offshore environment water resources, sediment, or aquatic life, as no action will be taken which will cause impacts. No short or long term, including cumulative effects are anticipated under the no action alternative, as no action will be taken, and only existing natural and human-induced impacts will continue without the influence of any project actions.

Alternative B, Beach Manipulation/Scraping Impacts
Under the Beach scraping alternative, no impacts are expected to the off shore marine environment. Activities will be restricted to above the mean high water mark so that any disturbance is expected to be localized and short term not reaching the off shore environment. Since sand is available for harvest after the summer accretion period, there is a negligible potential for cumulative impacts to shoreline transport of this material in the natural system. Natural littoral processes would replenish the relatively small volumes of sand removed during the scraping process and no long-term or cumulative effects to the sand budget are expected.

Alternative C Beach Nourishment Impacts
Dredging has been defined as "an earth-moving process specialized to remove bottom material from under water to increase the water depth or gain the bottom material" (ACOE, 1991). Impacts associated with dredging at the proposed borrow area site in order to provide a clean source of sand for project beaches, and fill placement of the resultant material, are the major subjects of this section.

Dredging for this type of beach nourishment project can be accomplished by either a hopper dredge or a hydraulic (cutterhead) dredge. Although the techniques may differ, the outcome is the same: a specified area will be dredged to a depth (not to exceed twenty foot below existing ocean bottom) which will provide sufficient material to meet the necessary volumetric beachfill requirements.

Standard dredging practices aim to avoid disturbing and dredging sediment types that are of high benthic quality and that are not compatible with the sand at the placement area. Areas that contain material that is not consistent with the placement area are not utilized. Also, as standard practice, the borrow areas will be dredged to the minimum depth required with gently sloping sides to avoid a reduction or loss of circulation that may reduce dissolved oxygen (DO) levels.

The biological community most likely impacted by the mining of sand at the borrow area would be both the macro and megabenthic invertebrates. Two types of potential impacts could result: impacts (direct mortality) to organisms that are removed with the sediments utilized for beach nourishment; and impacts to down-drift benthic organisms that are covered or otherwise affected by the suspended sediments resulting from the dredging operations. However, in regards to the latter, several factors must not be overlooked. First, because both hopper and hydraulic dredges operate via suction, and because they are working in relatively course sands, increases in turbidity are expected to be moderate and localized. Second, as the dredge operation proceeds, a contiguous area large enough to provide the needed volume of sand will be dredged. Because the previously discussed effects related to increased turbidity will be localized, they will occur near the dredge head within the construction zone, i.e., over sediments that will eventually be used for beach placement. Therefore, only an area very small in comparison to that which is to be dredged (the down drift borders of the completed borrow site) has the potential to be affected by re-suspended sediments.

The effects on the environment of the operation of dredging and fill placement are influenced by the conditions at the dredging site, by the nature of the materials dredged, and, both directly and indirectly by the types of equipment used. By their action, dredges may cause a variety of environmental impacts to the marine ecosystem. These include:

- Increased levels of turbidity and suspended solids possibly resulting in:
- Reduction of dissolved oxygen levels.
- Gills and filter-feeding structures becoming clogged.
- Destruction of benthic organisms entrained within the dredging device.
- Altered benthic diversity following recolonization.
- Changes in circulation patterns.
- Modified sediment deposition.
- Creation of either hypoxic or anoxic zones.
- Modified behavior of organisms due to increased stress levels possibly affecting reproduction.

Since dredging involves the direct mechanical harvest of sand from the borrow site, there is a moderate, short-term impact expected to the benthic habitat and communities within the dredged area. The ACOE borrow site number two approval process included cumulative impact analysis in its determination of volume of sand permitted to be removed, and natural coastal processes area expected to restore the borrow site to normal conditions. Long term impacts may result from repeated use of the offshore sand resources. Schwab et. al. reported in 2002 that offshore sand sources may be a major sources of sand being transported onshore. Mining this resource of sand repeatedly for beach nourishment projects may deplete this sand source leading to enhanced erosion of the barrier island.

Alternative D. Preferred Alternative - Combination of scraping and nourishment project Impacts

Impacts of Alternative D are expected to be the same as both alternatives B and C, since this is the combination of both actions.

Water Quality

Alternative A, No action Impacts

No impacts are expected to water quality except in the most severe and unlikely event of an overwash or breach. In the event of an overwash, potential surges of ocean water may sweep across the island and reach across to the bay. These overwashes would then affect salinities in the both the bay and any ponds or bogs which would be overwashed.

In the event of a breach, the resulting increased flushing in the bay would have the potential to improve water quality by reducing the number of waterborne pathogens and nutrients. Additionally, eelgrass beds could potentially expand due to improvements in water clarity, thus providing vital habitat for the bay scallop as well as nursery habitat and a predator refuge for other species. However, Bay salinity averages 29 parts per thousand is already nearly oceanic, and a higher average salinity may alter estuary's general character.

Predicting the potential for breaches, as well as the locations of breaches, and the resulting affects of these potential breaches is outside the scope of this document. By not issuing Special Use Permits and any resulting projects to be permitted within FIIS that would include tapers beyond the community property lines, these potential breaching-avoidance impacts are then limited to only in front of the communities where they might be detrimental to water quality from flooded septic systems. A breach or overwash in the community areas would likely result in significant quantities of human wastes and structural debris that could float, be suspended, or buried in the bay, marshes and bogs. Even though current laws exist to provide for the clean up of such debris, history has shown a lack of compliance and impacts may last beyond short-term.

No cumulative effects are expected unless repeated breaches occur which would change the communities themselves and could change the water quality of the ocean, bay, marshes and bogs.

Alternative B, Beach Manipulation/Scraping Impacts
Impacts from beach scraping are expected to be localized and short term, as disturbance will occur above the low water mark. It is anticipated that there is at most a negligible, short-term effect on water quality in the intertidal and near shore environment, as this is a high-energy zone with mixing and transport of sediment with each wave and tidal cycle. It is anticipated that the area's water quality will not be affected and that any potential disturbance would be minimal and temporary, quickly returning to normal within a tide cycle.

No cumulative impacts are expected, as no significant water quality effects are apparent from past years of this activity, since it occurs outside of the potentially effected aquatic zone.

Alternative C Beach Nourishment Impacts
There will be short-term, moderately adverse water quality impacts during the construction period of this project. Naqvi and Pullen (1982) conclude that problems with anoxic sediments and nutrient release in the nearshore zone of a high-energy beach as a result of beach nourishment do not appear to be significant because: (1) Fine materials that are high in organics are generally

moved offshore; (2) Sulfides are rapidly oxidized; and (3) Fine sediments are rapidly diluted by the high-energy mixing process. Dredging the proposed borrow areas will generate turbidity and sedimentation impacts within the immediate vicinity of the operation, and does not appear to significantly impact water quality (Naqvi and Pullen, 1982). Generally, the large grain-sized material will keep the area of impact small and will ensure that there are no impacts beyond the period of construction. The construction period for each specific project will last no more than one or two months and localized water quality impacts will be experienced in the proposed borrow area for that duration. Similar short-term water quality impacts will occur at the nourishment sites along the shore but these impacts should not alter the water quality classifications set by the NYSDEC. Fill operations will deliver a slurry of sand to the receiving shore, increasing turbidity in the immediate area. This effect, however, will not be significant since turbidity levels in the high-energy surf area are naturally high. In addition, turbidity and total suspended sediments can be orders of magnitude higher on a regional scale compared to levels measured during placement operations that only affect a localized area of hundreds of meters (NJBMP 2001).

Long-term impacts to water quality are not expected to occur as a result of project implementation. Short-term turbidity may affect organisms in several ways. Settling of sediments may bury sedentary species. Suspended matter can clog gills and filter-feeding structures, which could directly cause mortality or reduce energy efficiency, and cause indirect effects such as reduction in reproduction or decreased ability to avoid predation (Sherk, 1971). In addition, turbidity may temporarily reduce light penetration, lowering photosynthetic activity and dissolved oxygen content. Turbidity and associated water quality parameters at the borrow areas and placement sites will rapidly return to preconstruction levels with no lingering adverse impacts expected (Naqvi and Pullen, 1982).

Based on study results, as well as a general review of dredging operations across the country (LaSalle, 1986), it is reasonable to conclude that, except for special or unusual circumstances, dredging related to beach nourishment does not produce a long-term significant adverse impact to water quality.

Dredging would have a short-term negative impact on water quality since during dredging and construction, there will be increased suspended sediments in the water column, but they will settle rapidly due to large size, and will not impact water quality for any extended length of time. In addition, dredging will not impact dissolved oxygen levels, as the depth of dredging will not extend into or create anoxic conditions.

No Cumulative Impacts are anticipated to water quality, as the short-term impacts of each project would have dissipated due to natural processes.

Alternative D. Preferred Alternative - Combination of scraping and nourishment project Impacts
The impacts of Alternative D are expected to be the same as Alternative C.

Shoreline processes

Alternative A, No action Impacts
If "No Action" were taken to reduce or modify the ongoing shoreline changes then there would be no modification to the natural processes and therefore no impact to the environment. Potential impacts that would be part of a breach in the communities will not be addressed since they are outside of the scope of this document.

No cumulative effects are anticipated.

Alternative B, Beach Manipulation/Scraping Impacts
Impacts from beach scraping to the beach itself are expected to be negligible to minor and short-term as they will be very localized in nature and only small volumes of sand will be removed and expected to be replenished by littoral shoreline processes within a short time.

The manipulation of beach sand into dunes, however, does impact the storm protection provided by naturally formed dunes, through both crushing the dune grass rhizomes that hold the sand in place, as well covering the dune grass and altering the process by which sand accretes into the dunes making them stronger. Natural dune recovery has been documented as being major within a few years at several areas in Fire Island. In the communities where dune recovery is performed through manipulation, these rebuilt dunes are not believed to function as well. Their composition is neither tightly packed, fine grain sized sediment nor do vegetal root systems extend to the base of the dune, as would be the case in a natural dune built by Aeolian processes. Although artificial dunes are often planted with beach grass (Ammophila breviligulata), the way a natural dune would have grown vertically with a concomitant vertical extension of the plant system, the internal strength of the sediment composing them is relatively weak. Mycorrhyzal fungi are also common in natural dune systems and further bind sand grains to resist erosion (Allen, et al, 2002). Thus the beach scraping process may actually retard the growth of strong, more resilient dunes.

As long as no structures are built or enlarged behind the manipulated dunes, no cumulative effects are anticipated.

Alternative C, Beach Nourishment Impacts
Since nourishment projects have a multiple year design, storm protection effects as well as any impacts would therefore be moderate and long-term. Nourishment places larger sand volumes that are expected to cover existing beach and dunes and result in minor to moderate impacts to shoreline processes. The increase in beach width and dune height would temporarily alter the natural forces of island

migration, but beach and dune fill projects appear to have short-lived effects, relative to longer-term trends and the natural variability of coastal processes and storm events (Allen, et al, 2002).

The manipulation of sand into dunes, however, does impact the storm protection provided by naturally formed dunes, through both crushing the dune grass rhizomes that hold the sand in place, as well covering the dune grass and altering the process by which sand accretes into the dunes making them stronger. Natural dune recovery has been documented as being major within a few years at several areas in Fire Island. In the communities where dune recovery is performed through manipulation, these rebuilt dunes are not believed to function as well. Their composition is neither tightly packed, fine grain sized sediment nor do vegetal root systems extend to the base of the dune, as would be the case in a natural dune built by Aeolian processes. Although artificial dunes are often planted with beach grass (Ammophila breviligulata), the way a natural dune would have grown vertically with a concomitant vertical extension of the plant system, the internal strength of the sediment composing them is relatively weak. Mycorrhyzal fungi are also common in natural dune systems and further bind sand grains to resist erosion (Allen, et al, 2002). Thus the beach nourishment process and creation of enlarged dunes may actually retard the growth of strong, more resilient dunes.

Minor cumulative effects are anticipated due to the massive manipulation undertaken during renourishment. As long as no structures are built or enlarged behind the manipulated dunes these cumulative impacts will remain minor.

Alternative D. Preferred Alternative - Combination of scraping and nourishment project Impacts
Impacts of Alternative D are anticipated to be a combination of both Alternatives B and C.

Beach Ecosystem

Alternative A, No action Impacts
No impacts from the No Action Alternative are expected because it allows natural processes to continue. IAssuming there is no catastrophic storm in the next three years, it is unlikely that extensive new habitat would be created, although smaller pockets of higher beach, suitable for plant and bird species might be created.

On a natural barrier beach the primary dune vegetation is well adapted to, dependent on, and maintained by changing substrate conditions. Dune grass relies on a steady supply of fresh sand to maintain vigor. Co-dominant species, such as beach pea and seaside goldenrod, tend to invade the dunes once the beach grass has become established.

If beaches are not scraped, vegetation might spread and trap more sand then if the vegetation were buried too deeply or destroyed. The dunes could increase from their current configuration and serve to form a more resilient means of storm protection.

History has shown that following winter storms on Fire Island National Seashore, structural debris has a tendency to collect and accumulate on the ocean beach areas located in front of FIIS properties and adjacent to the communities. Such debris not only pose safety concerns for human passersby and detracts from the natural beauty of national park shores but also has a major long term negative impact on our beach ecosystems, including our threatened and endangered species.

Alternative B, Beach Manipulation/Scraping Impacts

Beach scraping will result in minor short-term, localized impacts to the beach and its invertebrate infauna. Scraping will be limited to only directly in front of the communities that are permitted to scrape. Infauna will likely be wiped out during the sand harvesting process, but will recolonize quickly, since only approximately 1' of sand will be removed from the surface and recruitment from adjacent beaches will likely occur within a few weeks, as the beach profile is restores itself. Psuty (pers. comm.) described beach profiles returning to normal within one week, while other beach scraping projects that might not have been properly monitored and enforced, took much longer (Finn, pers. comm.). Since a gradually increasing sloping beach will slow wave energy more effectively then a flat beach, if too much material is scraped, the beach profile is lowered and wave energy will rapidly attack the new scraped dune.

The proposed scraping alternative will require a minimum 100 foot beach width and a gradual sloping of a minimum of 8' up to 9' profile which will provide the natural wrack line establishment, nutrient and seed dispersal, and recolonization by native beach flora and fauna. This reduces the potential for scarping of the beach face and results in a more natural functioning beach. The time it would take for natural flora recolonization is uncertain, with seed and roots being buried. The created dunes will be planted with native stocks of dune grasses at varying plant densities to satisfy the US Fish and Wildlife Service.

Debris removal, including snow fence, must be enforced as part of this process or could represent a significant impact on the beach and dune integrity, aesthetics, threat to wildlife, human safety, and visitor experience.

Development of strong, more resilient vegetative dunes with webs of beach grass may be retarded, transition to other successional species may be slowed as well, although given the density of structures behind the dunes, and these species may not flourish anyway. However, past experience over the last 10 years of less restrictive beach scraping does not appear to have had a significant impact on the beach ecosystem (Psuty, pers. comm., Allen pers. comm.DOI). Because of the high energy dynamics of the beach zone, and the migrating cells that produce natural traveling indentations along the shoreline, effects of beach scraping are erased by the periodicity of dimensional changes brought about by these natural variations (Psuty, pers.comm.).

Alternative C Beach Nourishment Impacts

Beach nourishment is likely to result in minor to moderate long-term impacts to the beaches in front of the communities that are permitted to utilize this protective method. Because the renourished dune/beach profile is designed to protect against storm surges, shoreline changes will be altered for a short period. The renourished beach/dune profile, more closely simulating that of a natural dune in placement, dimensions and function, will have less impact than the typical engineered design. Beach slope from 0' up to 9' at the beach berm at 1- vertical :15-horizontal, will reduce beach scarping, allow for natural wrack line establishment, nutrient and seed dispersal, and recolonization by native beach flora and fauna. Placement of the dune along its preexisting crest line will improve the stability and function of the renourished dune, except where houses and other structures exist in the dunes, it may not be possible to achieve the full height or volume of dune, although beach replenishment may still occur.

Expected impacts include burial of beach, dune and intertidal fauna and flora, prevention or retarding of natural overwash processes in the communities which would result in the prevention of early successional habitat in the communities. Recognition that this habitat is in front of developed communities, subject to increased visitation and disturbance is also an important consideration in this impact analysis. In terms of impacts to the fauna in the swash/intertidal zone, there was no statistical difference in abundance, diversity, composition, or total biomass between samples collected before and after nourishment in NJ study areas (ACOE 1999a, 1999b, 2001). It is possible that the creation of a wider beach-face could support increased populations of species, both plant and animal. However, given, the anticipated short time period that the supplemental sand is expected to remain it is unlikely that significant populations of such species would be maintained.

Debris removal, including snow fence, must be enforced as part of this process or could represent a significant impact on the beach and dune integrity, aesthetics, threat to wildlife, human safety, and visitor experience.

Cumulative impacts of renourishment include the prevention of overwash or breach formation, which is a natural maintenance feature of barrier islands, thus preventing widening of the island. This EA does not authorize more than one renourishment project per community.

Alternative D. Preferred Alternative - Combination of scraping and nourishment project Impacts

Impacts of Alternative D are anticipated to be the same as those for Alternatives B and C.

Special Status species

This EA focuses on the two (2) federally listed terrestrial species, the piping plover and sea beach amaranth, as well as the aquatic sea turtles and marine mammals that potentially occur in the action area (Table 3). It briefly summarizes the other rare species of concern. Tables 4,5, and 6 summarize the potential impacts of each alternative on each of these special status species.

Impacts of Alternative A- No Action

The no-action alternative has the potential for both beneficial and adverse impacts to federally- or state-listed terrestrial species of concern, including piping plover, roseate tern, least tern, common tern, seabeach amaranth, and seabeach knotweed. No effects are anticipated for the aquatic marine mammals or sea turtles (Table 3). Only in the unlikely event of a breach would they be impacted, and then the short and long-term effects are unpredictable as to whether they would be positive or negative due to the potential implementation of the BCP or Emergency actions which would likely repair areas in front of communities. The park would continue to protect special status species by implementing measures specified in its Endangered Species Habitat Management Plan, including driving restrictions on specified beaches during nesting season and fencing areas that support nesting birds. Removal of debris (resulting from overwash/breach in communities including snow fence) would need to be enforced or could represent a significant impact to beach and dune integrity, aesthetics, and visitor experience. It could also represent a threat to wildlife and human safety.

Potential Beneficial Effects of No Action on T and E Species

Temporary overwash conditions due to no action may enhance and provide additional temporary breeding habitat, until natural island dynamics succeed and revegetate these areas. The unlikely event of a breach and new inlet formation might also provide temporary additional breeding and foraging habitats on the beaches of this new inlet. New east-west facing beaches with the potential for flat and pool development would provide improved foraging habitat for plovers as well as a potentially more sheltered beach condition and higher productivity. These habitats are now rare on Fire Island. Numerous Atlantic coast studies have documented the importance of beaches with bayside access, overwash and tidal bay flats on piping plover distribution and reproductive success including NPS 1998, Coutu et. al. 1990, Elias, et. al. 2000, Elias-Gerken 1994, Goldin 1990, Goldin and Regosin 1998, Hoopes 1993, Houghton et. al. 1995-2002, Howard et. al. 1993, Jones 1997, Loegering 1992, NPS and MD DNR 1993-1997.

These newly formed overwash areas could support nesting piping plovers, as has occurred on Westhampton Beaches in similar barrier breach conditions as Pikes and Little Pikes Inlets (Houghton et. al. 1995-2000). Enforcement and education will be critical in protecting these sites from the pressures of high public use at these highly visible and accessible community areas. The longevity of such conditions is uncertain, as the BCP and other emergency actions could be implemented to quickly repair the beaches in front of communities.

Potential Adverse Effects of No Action on T and E Species
If overwash was to occur in front of the communities, the additional habitat created would likely be sub-optimal, as overwashes would be within close proximity to or under community structures and resulting debris. Human activity in the area is anticipated to be high as well as the potential for predation. Attracting birds to sub-optimal, heavily disturbed community areas could result in population sinks, where productivity and nesting/fledging success could be lower than in more natural, undisturbed habitat.

The potential direct adverse impacts of flooding from more intensive overwashes or breach could cause adult and chick mortality or loss of eggs and habitat. Additionally, beach/dune repair and restoration could occur during the nesting season, resulting in direct impacts from construction activities. If repair was made outside of the plover season, preclusion of high quality overwash/inlet/back bay habitat would still result.

Similar beneficial and adverse effects are anticipated for sea beach amaranth as it also occurs in the early successional, dynamic beach habitats similar to plovers. Amaranth occupies a narrow beach zone (0.2-1.5 m above mean high tide) including overwash flats and lower foredunes of non-eroding beaches and even secondary habitats like dune blowouts (Weakley and Boucher 1992). No action could create new, additional habitat in preferred back bay and overwash areas with higher carrying capacity for a temporary period.

This potential positive effect would not, however, avoid the adverse potential of direct impact if flooding was to occur in these newly formed habitats. This could result in loss of individual plants and the seed bank. Since it is intolerant of flooding, amaranth could experience low productivity (loss or burial of seed bank) or mortality in active overwash or breach conditions. Therefore the no action alternative has the potential to directly affect this species, as storms and shoreline change would potentially occur at the time of year when it was present.

No action potential impact summary to plovers and amaranth:

Potential Beneficial Impacts

- Increase in suitable, available habitat

- Enhanced habitat diversity through creation of preferred overwash, back-bay and inlet habitat
- Decrease in denning habitat and predation
- Increase in and perpetuation of natural habitat formation and barrier island dynamics

Potential Adverse Impacts

- Creation of sub-optimal and functionally unsuitable overwash habitat within community areas
- Increase in human disturbance/debris within community areas
- Increase in predation associated with human presence/pets within community areas
- Increase in flooding- potential mortality and decreased productivity
- Creation of population sink conditions

Sea Turtles and Marine Mammals

- No impacts anticipated due to no action

Table 5. Potential Effects of the No-Action Alternative on Special Status Species in the Action Area.

Common Name (Scientific Name)	Status*	Potential Effect
Piping plover (*Charadrius melodus*)	FT, SE	Potential to have minor to moderate positive or negative impacts if species is present. Potential habitat, including ocean-side beach and foredunes and bayside foraging areas could be increased or decreased—unpredictable.
Roseate tern (*Sterna dougallii*)	FE, SE	Not likely to adversely effect to potential positive or negative effect from habitat increase or decrease. Species has not been documented in the action area and potential nesting habitat on ocean-side beach and foraging habitat in Great South Bay would not be affected.
Least tern (*Sterna antillarum*)	SE	Not likely to adversely effect to moderate positive or negative impacts. Potential habitat, including ocean-side beach and foredunes and bayside areas could be increased or decreased—unpredictable.
Common tern (*Sterna hirundo*)	ST	Not likely to adversely effect to moderate positive or negative impacts. Potential habitat, including ocean-side beach and foredunes and bayside areas could be increased or decreased—unpredictable.
Finback whale (*Balaenoptera physalus*)	FE, SE	Not likely to adversely effect. Potential habitat would not be affected.
Humpback whale (*Megaptera novaeangliae*)	FE, SE	Not likely to adversely effect. Potential habitat would not be affected.
Right whale (*Balaena glacialis*)	FE, SE	Not likely to adversely effect. Potential habitat would not be affected.
Green sea turtle (*Chelonia mydas*)	FT, ST	Not likely to adversely effect. Potential habitat would not be affected.
Loggerhead sea turtle (*Caretta*	FT, ST	Not likely to adversely effect. Potential habitat would not be affected.

Common Name (Scientific Name)	Status*	Potential Effect
caretta)		
Kemp's ridley sea turtle (*Lepidochelys kempii*)	FE, SE	Not likely to adversely effect. Potential habitat would not be affected.
Seabeach amaranth (*Amaranthus pumilus*)	FE, SE	Potential to have minor to moderate positive or negative impacts. Potential habitat, including ocean-side beach and foredunes and bayside areas could be increased or decreased—unpredictable.
Seabeach knotweed (*Polygonum glaucum*)	SR	Potential to have minor to moderate positive or negative impacts. Potential habitat, including ocean-side beach and foredunes and bayside areas could be increased or decreased—unpredictable.

*FE = federally endangered
*FT = federally threatened
*SE = State endangered
*ST = State threatened
*SC = Special concern

Cumulative Effects.

Although the no-action alternative could affect listed species either positively or negatively, a variety of historic, on-going and planned activities will continue to affect these species. Residential development and recreational use /facilities in areas throughout the park have resulted in habitat loss and degradation to threatened and endangered species. Associated human disturbance, including driving, hiking on beaches and walking unrestrained pets, also adversely affect species of concern by interfering with reproductive and foraging behavior and result in direct mortality when plants and animals are crushed by beach-driven vehicles or killed by unrestrained pets. Planned continuance of the ACOE authorized FIMP (listed in project background) and its reach projects represent continuing shoreline stabilization to Long Island and preclusion of natural habitat formation in New York and coastwide.

Conclusion

The no-action alternative could affect federally or state-listed species of concern either positively or negatively, depending upon the timing and extent of the overwash/breach and severity of storm/weather conditions. The park would continue to operate under its Endangered Species Management Plan, which incorporates measures to protect species of concern, and would continue to report the results of its inventory and monitoring program to the USFWS and NYSDEC.

Potential Impacts of Alternative B- Beach Scraping

Beach scraping represents a redistribution of sand to result in a beach profile of a minimum of 100' beach berm width with a seaward slope of 1:10-15. Total post-scraped dune profile would have the following horizontal dimensions from the inland toe of the foredune seaward tow of the dune and beach berm: foredune = 1:4 slope up from 9.0 NGVD to 16.5 NGVD (= 30 feet) + 30 feet dune crest + 1:4 slope down to 9.0' NGVD (= 30 feet) for a total of 90ft (base) + beach berm (100ft) @ a minimum allowed 8.0 feet NGVD. Therefore to scrape there must be a minimum of 9.0 feet NGVD beach berm height and 100 feet of beach at that height. Dune profiles are 16.5' in height, with a 30' crest width and a minimum 8.0 'NGVD base elevation after scraping. Criteria describing the conditions under which Beach Scraping activities could be permitted are listed in Table 4. These criteria, therefore, represent the "proposed action description" as they describe what each scraping project would be designed to include.

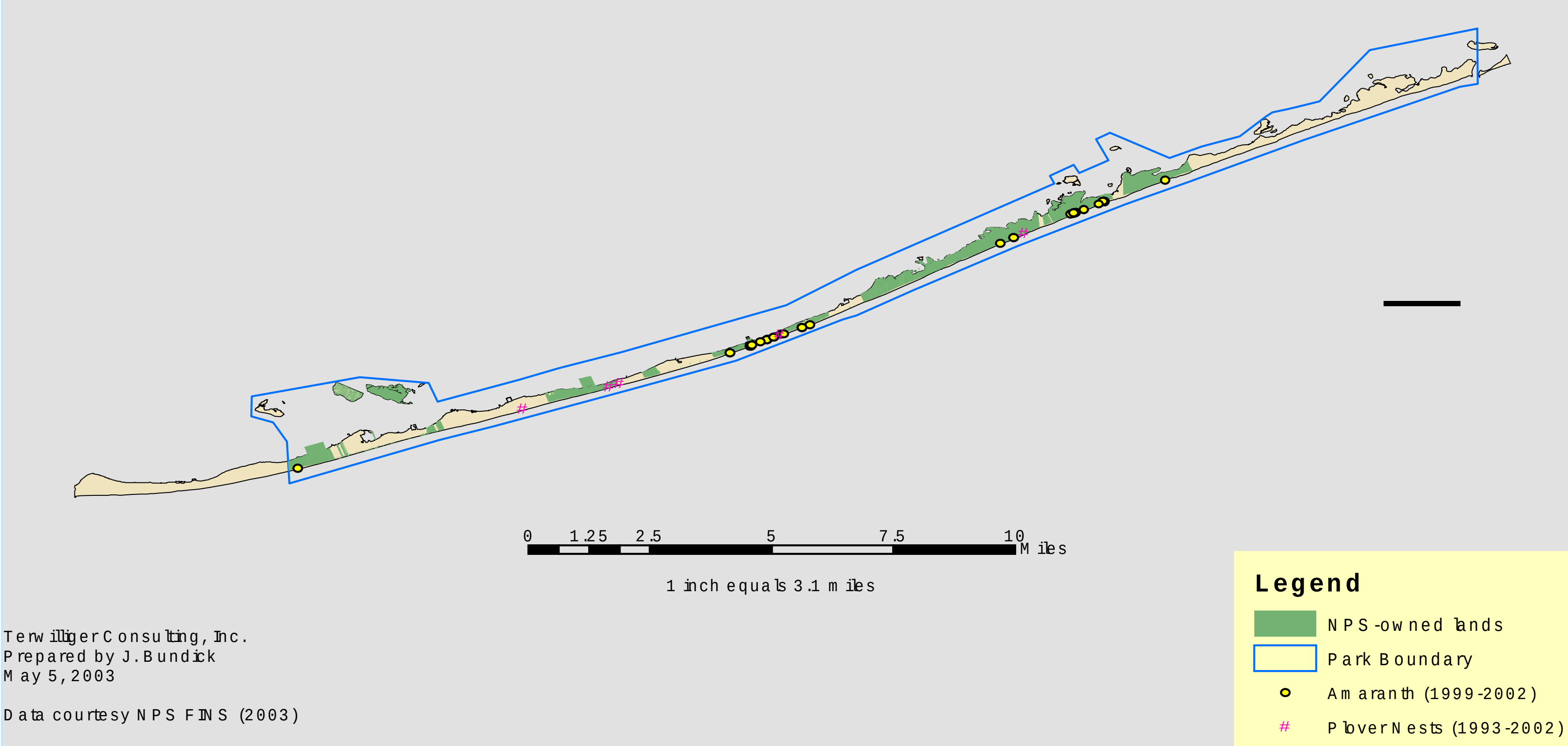
Assessment of Potential Direct Impacts of Beach Scraping on T and E Species

Take of beach species (piping plover and amaranth) from construction and other beach scraping activities includes harm or harassment to individuals from construction or other project related activities such as disturbance to animals and their habitat. For the plant species, this includes amaranth mortality and burial of its seed bank due to fill placement.

Seabeach amaranth and piping plover could be directly impacted under this alternative, as differing quantities of sand would be placed/redistributed on sections of beach involving manipulation of the beach area by construction equipment. However, historical and current distribution of these species has not been in the community areas where potential projects are proposed. There are six recorded locations of seabeach amaranth on Fire Island. The largest concentrations of the plant have been recorded at Democrat Point and Smith Point (NPS 2001b). Most of the piping plover and nest occurrences have been recorded in the Wilderness Area and the Sunken Forest/Sailors Haven area, however several birds and nests have been located in or around communities in front of Cherry Grove in 2002 and Water Island in 1997 [Figure 2 (color version of Figure 2 is available on page 146), Table 2].

Figure 2. Piping Plover and Sea Beach Amaranth on Fire Island National Seashore

**Plover data from 1993-2002 and Amaranth data from 1999-2002*



Therefore, direct impacts on listed species are not anticipated for two reasons. Although there have been breeding activity documented in front of two communities and adults observed in front of others, substantial breeding of listed species are not expected to occur in the community areas since existing beach profiles and human disturbance conditions are for the most part unsuitable. Second, the criteria for beach scraping activities restricts activity to the time of year when species are not present to avoid and minimize direct impacts. Plovers are expected to leave the area by September, and amaranth, although presence is unlikely, is expected to have peaked in seed production by November.

A requirement of beach scraping is to conduct surveys for both species (per USFWS conservation measures protocol) prior to and during such activities so that species status is accurately determined. If plovers are present, then no scraping will be conducted. If amaranth is present, then protective fencing (per USFWS conservation measure protocol) will be used as a protective buffer and monitored until natural annual mortality occurs. In the event of amaranth presence and construction activities unable to avoid plants physically or time of year, plants will be transplanted to similar nearby project site habitat and protected through fencing and educational signs and monitored. Burial of seed bank with sand moving in beach scraping is also a potential adverse impact. An additional measure to minimize and compensate for any amaranth direct take, seeds would be collected and germinated and replanted in the project site and protected through natural senescence (per USFWS protocol, USFWS 2002).

Beach scraping is not expected to impact sea turtles or marine mammals, as all activities are restricted to above mean high tide and aquatic habitat would not be impacted by these terrestrial activities.

Assessment of Potential Indirect Impacts of Beach Scraping on T and E Species

Potential indirect impacts are anticipated to plovers and amaranth and their habitat. Beach manipulation and sand placement could have both beneficial and adverse effects on these beach-dependent species. If the result of the beach scraping produces a higher, wider beach and more available, suitable habitat for both amaranth and plovers, there can be potential positive habitat impacts. This could reduce flooding and potential loss of individuals and progeny (young and seed bank) and provide additional habitat for more colonization.

On the other hand, creating additional habitat in heavily disturbed community areas could result in sub-optimal or nonfunctional habitat, which could also result in a population sink. Wider, higher beaches could attract and result in higher recreational use and an increase in predation with additional habitat available for denning. Numerous studies have documented the direct and indirect adverse effects of human disturbance on piping plovers (Burger 1987, Melvin et. al. 1992, Howard et. al. 1993, Elias-Gerken and Fraser 1994, and Strauss 1990).

Since the ocean beaches already receive high public use and have protected areas for rare flora and fauna, no shift or change in existing use is expected. This is also the case with human induced predator impacts, as both beach conditions and predator populations fluctuate and cycle.

Further, construction activities would temporarily impact beach invertebrates and prey base of plovers as well as the potential habitat and seed bank of amaranth. Intertidal zone prey base would not be affected, as project activities are restricted to above high tide water. Redistribution of sand from the beach to the dune could also bury rhizomes and affect the integrity of the dune and have the potential for increased scarping. Beach scraping criteria, however, were developed to maintain 100’ minimum beach width at 8.0’ NGVD.

Manipulation of the beach and dune building could preclude natural overwash processes and early successional habitat formation in the short term. Scraping would also bury or remove established beach vegetation and temporarily retard vegetative growth. It would provide a gently sloping beach and wider intertidal areas for increased plover breeding and foraging and invertebrate amaranth colonization. Scraping could also bury or temporarily remove the wrack line, an important source of prey for plovers.

Manipulation of the beach towards more stabilized conditions can preclude natural habitat formation, including overwash and back-bay foraging sites. The habitat resulting from scraping activities will be temporarily changed, as well as available prey base (potential removal of wrack/beach invertebrates). These conditions may be positive or negative, as more beach will be available as breeding habitat, but natural habitat formation of overwash areas could be precluded. These manipulated conditions are expected to be temporary and localized and quickly recover and recolonize with prey. Effects of scraping are recognized to not last through the dynamic winter when the shoreline is returned to its natural configuration (Psuty, pers. comm. 2003).

Summary of Potential Impacts of Alternative B- Beach Scraping on Listed Beach Species and their Habitat

Potential adverse impacts

- Disturbance to prey base and temporarily reduced prey availability (beach invertebrates and wrack line).

- Reduction of potential for formation and maintenance of optimal overwash or bayside piping plover breeding and foraging habitat.

- Disturbance to plovers through enhancing beaches to attract increased recreational activities by heavily used recreation beaches on oceanside.

- Habitat destruction and disturbance, including the potential for additional development and stabilization efforts resulting in additional or expanded structures/use.

- Increased potential predator populations/activity that could utilize habitat created by the project.

- Creation of sub-optimal habitat and potential population sink within community areas

- Potential for direct impacts from construction if conducted outside of the safety window- mortality, loss of productivity or disturbance to plovers and amaranth including burial of seed bank and increased predation.

Potential beneficial impacts

- Enhanced beach profile for increased nesting, colonization, germination and foraging habitat

Table 6. Potential Effects of the Beach Scraping Alternative on Special Status Species .

Common Name (Scientific Name)	Status*	Potential Effect
Piping plover (*Charadrius melodus*)	FT, SE	Minor to moderate negative or positive effect. Beach scraping would result in a different beach profile, likely wider beach with more foraging and nesting habitat. Since birds are not in area during construction time, no adverse direct impacts anticipated. Surveys, monitoring and USFWS protocol will be followed. Potential indirect adverse impacts: preclusion of natural and overwash habitat, creation of sink/ sub-optimal habitat, burial/manipulation of prey base, increased recreational and predation impacts.
Least tern (*Sterna antillarum*)	ST	Not likely to adversely effect. Historical and current use not documented or likely due to narrow beach width and heavy human use. Potential positive and negative effects similar to plover.
Common tern (*Sterna hirundo*)	ST	Not likely to adversely effect as species is unlikely to occur in the action area. Potential positive effects: creation of suitable habitat for loafing and resting. Potential positive and negative effects similar to plover.
Kemp's ridley sea turtle (*Lepidochelys kempii*)	FE, SE	Not likely to adversely effect. Species has not been documented in action area during proposed project activity period. NMFS conservation measures will be followed to avoid and minimize impacts.
Leatherback sea turtle (*Dermochelys coriacea*)	FE, SE	Not likely to adversely effect. Species has not been documented in action area during proposed project activity period. NMFS conservation measures will be followed to avoid and minimize impacts.
Atlantic green sea turtle (*Chelonia mydas*)	FT, ST	Not likely to adversely effect. Species has not been documented in action area during proposed project activity period. NMFS conservation measures will be followed to

Common Name (Scientific Name)	Status*	Potential Effect
		avoid and minimize impacts.
Loggerhead sea turtle (*Caretta caretta*)	FT, ST	Not likely to adversely effect. Species has not been documented in action area during proposed project activity period. NMFS conservation measures will be followed to avoid and minimize impacts.
Sei whale (*Balaenoptera borealis*)	FE, SE	Not likely to adversely effect. Species has not been documented in action area.
Finback whale (*Balaenoptera physalus*)	FE, SE	Not likely to adversely effect. Species has not been documented in action area.
Humpback whale (*Megaptera novaeangliae*)	FE, SE	Not likely to adversely effect. Species has not been documented in action area.
Northern right whale (*Eubalaena glacialis*)	FE, SE	Not likely to adversely effect. Species has not been documented in action area.
Harbor porpoise (*Phocoena phocoena*)	SC	Not likely to adversely effect. Species has not been documented in action area.
Seabeach amaranth (*Amaranthus pumilus*)	FE, SE	Minor to moderate negative or positive effect. Beach scraping could result in mortality to plants or burial of seed bank if conducted outside of safety window or protocol. USFWS guidelines will be followed to avoid, minimize and compensate, including surveying, fencing and monitoring. Scraping could result in a wider beach with potential for increased habitat for colonization but also accompanying human use/recreation.
Seabeach knotweed (*Polygonum glaucum*)	SC	Minor to moderate negative or positive effect. Beach scraping could result in mortality to plants or burial of seed bank if conducted outside of safety window. USFWS guidelines will be followed to avoid, minimize and compensate, including surveying, fencing and monitoring. Scraping could result in a wider beach with potential for increased habitat for colonization but also accompanying human use/recreation.

*FE = federally endangered
*FT = federally threatened
*SE = State endangered
*ST = State threatened
*SC = State species of special concern

Cumulative Effects
There is the unlikely potential for all Fire Island communities to beach scrape annually during the project timeframe. This could result in almost 6 miles of beach manipulation with the impacts discussed above. Additionally, the ACOE FIMP project and its associated reach projects are ongoing and planned for Shinnecock and Westhampton. This could result in additional shoreline stabilization along Fire Island during the scope of this project. The Fire Island Pines Dredging project has been proposed and may occur within the year. Additional FIIS and community projects may also be proposed within the project

life that may or may not have additional effects to this or the surrounding area, but cannot be predicted at this time.

Conclusion
The beach scraping alternative could affect federally or state-listed species of concern either positively or negatively, depending upon the timing and extent of projects and the severity of storm/weather conditions. Because projects would not be allowed to occur if species were present or conservation measures not a permit condition, no direct impacts are anticipated. Indirect impacts, however, could adversely or positively affect the plover and Amaranth. FIIS would continue to operate under its Endangered Species Management Plan, which incorporates measures to protect species of concern, and would continue to report the results of its inventory and monitoring program to the USFWS and NYSDEC.

Potential Impacts of Alternative C- Beach Nourishment
Impacts of beach nourishment address both the borrow and the fill aspects of potential community projects along the maximum potential 6 mile shoreline as well as the potential indirect impacts of an additional 6 miles of adjacent shoreline. The sand borrow source is anticipated to be Borrow Area 2, the approved ACOE Borrow site off shore from Fire Island Pines. The sand fill sites are restricted to the community property with no tapers on NPS land and no seaward build out of the existing dune zone. Beach/dune profile dimensions were developed by a team of coastal engineers and experts including ACOE, Coastal Planning and Engineering (CPE, Inc.), Rutgers University, and NPS staff and included the analysis of 20 years of data from 72 sampling profiles in developed areas and 50 profiles of undeveloped areas using 2000 LIDAR data (Psuty et al. 2003 (in press). The criteria for Beach Nourishment activities restricts the beach and dune profile to 30' dune crest width, 90' base dune width, 16.5' dune height and a cross-sectional area of approximately 450 square feet, with no seaward build out beyond the existing dune zone. These dimensions are thought to characterize the "natural dune systems" on Fire Island over the last 20 years.

Project criteria impose a time of year restriction for all construction activity that attempts to avoid and minimize any impacts to natural and cultural resources. Criteria require equipment transport to occur by water or interior road transport to avoid and minimize impacts to additional areas of the shoreline whenever possible. It places the financial responsibility as well as the responsibility to implement and enforce the pre, during and post-project survey and monitoring on the applicant/permittee for the life of the project. Criteria further require that grain size and sediment characteristics of the material to be deposited will be consistent with the existing beach substrate.

Assessment of the Potential Direct Impacts of Beach Nourishment on T and E Species

Take of listed species (plovers, amaranth, sea turtles and marine mammals) from construction and other beach nourishment activities includes harm or harassment to individuals from construction or other project related activities such as disturbance to animals and their habitat or increased predation. For the plant species, this includes amaranth mortality and burial of its seed bank due to fill placement.

Historical and current distribution of these species for the most part occurs outside community boundaries and on FIIS property. Several records and observations have been documented in and around communities (as described in species status) and shown in Figure 2. Community areas where potential projects might occur the closest to listed species are Water island and Cherry Grove, as well as some knotweed plants found on the beach in front of Lonelyville in 2001. There are six recorded locations of seabeach amaranth on Fire Island. The largest concentrations of the plant have been recorded at Democrat Point and Smith Point (NPS 2001b). Most of the piping plover and nest occurrences have been recorded in the Wilderness Area and the Sunken Forest/Sailors Haven area, however several birds and nests have been located in or around communities in front Water Island in 1997, Cherry Grove in 2002 (Figure 2, Table 2) and adults have been observed in the Kismet area in 2003.

Direct impacts on listed species are not anticipated for two reasons. First, substantial nesting or plant germinated listed species are not expected to occur in the community areas since existing beach profiles and human disturbance conditions are for the most part unsuitable, beaches are eroding and narrowing, both from natural and human-exacerbated forces, which remains the impetus for community nourishment projects. Second, the criteria for beach nourishment activities restrict construction to the time of year when species are not present to avoid and minimize take. Plovers, turtles and whales are not expected to be present, and amaranth, if present, is expected to have peaked in seed production and dispersal, and neared the completion of its annual cycle.

A requirement of beach nourishment is to conduct surveys for both species (per USFWS conservation measures protocol) prior to and during such activities so that species status is accurately determined. In the unlikely event that plovers or roseate terns are present, then no nourishment will be conducted until they have left the area. If amaranth is present, then protective fencing (per USFWS conservation measure protocol) will be used as a buffer and monitored until natural annual mortality occurs. In the unlikely event of amaranth presence and construction activities unable to avoid plants physically or seasonally, plants could be transplanted to similar nearby project site habitat and protected through fencing and educational signs and monitored. Burial of the seed bank with sand placement during beach nourishment is also a potential adverse impact. An additional measure to minimize and compensate for any amaranth direct take, seeds would be collected and germinated (per USFWS protocol, USFWS 2002b) and replanted in the project site and protected.

Beach fill activities are not expected to have adverse direct impacts on sea turtles or marine mammals, as these activities are restricted to above mean high tide and only localized aquatic habitat would be temporarily impacted as sediment may enter and mix from the intertidal zone. Because these activities are confined to the late fall and winter months when beach processes are highly dynamic, effects are expected to be minimal, and species are not likely to be present (Ruben and Morreale 1999, NMFS 1995).

Borrow activities, on the other hand, have the potential to adversely affect sea turtles and marine mammals if conducted during the time when they are present. Studies show that sea turtles utilize the Long Island waters in the warm seasons from June through October, and leave the area with falling water temperatures in September and are gone in early November (NMFS, 1995). The listed whale species are considered transient to the area and are not expected to be in the action area. Previous studies and NMFS Biological opinions indicate that nourishment projects off the south shore of Long Island and Northern New Jersey are not likely to adversely affect listed whales, but may adversely affect sea turtles if conducted in June through October with hopper dredging equipment (NMFS, 1995). NMFS further requires borrow area sampling prior to construction and trained NMFS observers to monitor the first cycle of dredging operations.

Potential direct impacts of dredging to sea turtles include the destruction and degradation of habitat as well as the incidental take of sea turtles by certain dredging equipment. Although dredging has not been implicated as a major cause of death or injury to sea turtles in the northeast, the potential exists for impacts from the use of hopper dredge equipment. Hopper dredges are known to entrain sea turtles, while cutterhead, clamshell and other similar dredges do not characteristically impact sea turtles (NMFS 1995).

Since turtles are mostly subsurface, observed most frequently in depths less than 15 m, they are thought to be using the New York waters as important feeding habitat for growth and development. Both borrow areas occur in 40-50' deep waters and the cut depth would range from 5 to11 feet below the existing surface. An important concern is to protect the benthic food resources within shallow embayments that serve as feeding grounds (Morreale and Standora 1994). It has been determined that NY borrow areas may contain benthic resources, that turtles may utilize deeper waters (greater than 15 m for resting or foraging, although infrequently in NY and NJ. While some turtles reside in shallow bays, others transit the NY bight frequently during a season. It has been further determined that few turtle interactions have been observed in monitored nourishment projects thought 1995 (NMFS 1995). Dredging equipment will be restricted to avoid and minimize potential effects to sea turtles. Hopper dredge use will only be allowed during the NMFS safety window and monitors will be utilized as necessary and required by NMFS.

Impacts to whales are not anticipated from these beach nourishment projects, but there is the potential for adverse impacts to sea turtles if hopper dredging is conducted during June through October. Conservation measures to avoid, minimize and mitigate for any possible impacts would be followed per NMFS guidelines.

Assessment of the Potential Indirect Impacts of Beach Nourishment on T and E Species

Indirect impacts are potentially anticipated to plovers and amaranth as beach profiles will change within and adjacent to the project areas where these species may be present. Beach manipulation and sand placement could have both beneficial and adverse effects on these beach species. If the result of the beach nourishment produces a higher, wider beach and more available, suitable habitat for amaranth, terns and plovers, there can be potential positive habitat impacts. This could reduce flooding and potential loss of individuals and progeny (young and seed bank) and provide additional habitat for more colonization.

On the other hand, creating additional habitat in heavily disturbed community areas could result in sub-optimal or nonfunctional habitat, which could also result in a population sink. Wider, higher beaches could attract and result in higher recreational use and an increase in predation with additional habitat available for denning. Numerous studies have documented the direct and indirect adverse effects of human disturbance on piping plovers (Burger 1987, Melvin et. al. 1992, Howard et. al. 1993, Elias-Gerken and Fraser 1994, and Strauss 1990). Since these community ocean beaches already receive high public use no significant shift or change in existing use is expected. This is also the case with human induced predator impacts, as both beach conditions and predator populations fluctuate and cycle.

Beach and dune building could preclude natural overwash processes and early successional habitat formation in the short term. Sand fill would bury established beach vegetation and temporarily retard vegetative growth. It would provide a gently sloping beach and wider intertidal areas for increased plover breeding and foraging as well as invertebrate and amaranth colonization. Nourishment could also bury or temporarily remove the wrack line, an important source of prey for plovers. Recognition that this habitat is in front of developed communities, subject to increased visitation and disturbance, is also an important consideration in this impact analysis.

Beach nourishment is likely to result in minor to moderate long-term impacts to the beaches in front of the communities that are permitted to utilize this protective method. Because the nourished dune/beach profile is designed to protect against storm surges, shoreline changes will be altered for a short period. The nourished beach/dune profile, more closely simulating that of a natural dune in placement, dimensions and function, will have less impact than the typical engineered design. The more gentle beach slope will reduce beach scarping, allow for natural wrack line establishment, nutrient and seed dispersal, and recolonization by native beach flora and fauna. Placement of the dune along its preexisting crest line will improve the stability and function of the nourished dune. Where houses and other structures exist in the dunes, it may not be possible to build the dune to the full 16.5 feet or 30 foot wide crest, but beach fill could still be deposited.

Placement of sand from the borrow area on to the beach and dune could also bury rhizomes and affect the integrity of the dune. Beach nourishment criteria, however, were developed to maintain 100' minimum beach width at 9' NGVD and a gradual seaward slope (1:15) to minimize scarping. Planting and snow fencing would be utilized only in accordance with USFWS recommendations.

Further, construction activities would temporarily impact beach invertebrates and prey base of plovers as well as the potential habitat and seed bank of amaranth. Studies show that the invertebrate populations are temporarily affected, but are soon recolonized and restored prior to the spring/summer plover foraging season. Expected impacts include burial of beach, dune and intertidal fauna and flora. Studies conducted in nearby, similar habitats indicate that the fauna in the swash/intertidal zone showed no statistical difference in abundance, diversity, composition, or total biomass between samples collected before and after nourishment in NJ study areas (ACOE 1999a, 1999b, 2001).

Beach nourishment may degrade the beach, intertidal and nearshore and borrow site habitat and preybase. The effects of dredging and fill placement are influenced by the conditions at the dredging site, by the nature of the materials dredged, and, both directly and indirectly by the types of equipment used. By their action, dredge and fill activities may result in temporary and localized:

- Increased levels of turbidity and suspended solids possibly resulting in:
- Reduction of dissolved oxygen levels.
- Gills and filter-feeding structures becoming clogged.
- Destruction of benthic organisms entrained within the dredging device.
- Altered benthic diversity following recolonization.
- Changes in circulation patterns.
- Modified sediment deposition.
- Creation of either hypoxic or anoxic zones.
- Modified behavior of organisms due to increased stress levels possibly affecting reproduction.

Since dredging involves the direct mechanical harvest of sand from the borrow sites (Borrow Area 2 East and West), there is a moderate, short-term impact expected to the benthic habitat and communities within the dredged area. ACOE studies indicate that over 16 million cubic yards of high quality sand material is available with an additional 30 million cubic yards (ACOE 1999) in medium quality substrate. This borrow area occurs in 40-50 ' deep waters and the cut depth would range from 5 to11 feet below the existing surface. Therefore it is not expected that nourishment projects from this action will have a long-term effect on borrow site quantity. Impacts on the borrow site quality and productivity are less well known, although studies indicate that borrow sites recover and recolonize (ACOE 2001) with natural ocean processes. These depths are not favored foraging sites by sea turtles, although they may be used infrequently (NMFS 1995). Further dredge area partitioning and depth restrictions (per NMFS guidelines) will be implemented as required.

Additional indirect impacts may result from the transport of the new fill sand by the littoral drift westward. Geologists predict that no more than one mile of westward drift would result, as the long shore currents and sediment transport are functioning at their capacity, moving the annual sediment budget along shore (Psuty and Keehn pers. comm. 2003). The change in sediment budget would provide for more sand available for transport, both water and air borne, to adjacent areas. This could result in accretion to adjacent beaches, creating potentially higher and wider beaches. This impact is the reason for defining the action area to span over a mile both east and west of the existing community action areas.

Fire Island is a barrier island that provides a variety of ecological functions to Long Island’s south shore. In particular, it demarcates the bounds between the marine conditions typical of the Atlantic Ocean and estuarine habitats in Great South Bay. A great variety of aquatic resources use these habitats for important life history functions. In particular, the ocean environment supports a variety of benthic fauna, crustaceans, mollusks and fish including: marine worms, amphipods, gastropod mollusks, urchins, ocean quahogs, surf clams, lobster (*Homarus americanus*), butterfish, bluefish, winter flounder, yellowtail flounder, summer flounder, Atlantic mackerel, striped bass and Atlantic cod. Use of the ocean and near shore areas is critical to recruitment stocks in recreational and commercial fisheries. The action area has been designated as EFH for a spectrum of species of concern, some of which are listed above.

In addition to impacting economically important species, the potential sand borrow activities could impact habitats that also support federally listed, endangered or threatened marine species including leatherback, green, Kemp's ridley and loggerhead sea turtles as well as finback, humpback, and northern right whales. Impacts to sea turtles and marine mammals will be avoided or minimized due to the timing of projects within the safety window, the selection of dredge equipment, and use of NMFS conservation guidelines. Hopper dredges will not be used except during the safety windows established by NMFS (May 1-November 15).

These nourishment impacts include potential repetitive disturbance of benthic communities at the borrow and nourishment sites, filling of intertidal and subtidal areas, interrupting the natural dynamics of barrier island migration, and increased turbidity during the dredging, filling and beach erosion components of each project cycle. Potential indirect adverse impacts include loss of habitat, decreased foraging opportunities with similar impacts to the aquatic resources that depend on this portion of the Atlantic Ocean to complete or sustain portions of their life cycle.

Summary of Potential Impacts of Alternative C- Beach Nourishment on Listed Species and their Habitat

Potential adverse impacts

- Disturbance to prey base and temporarily reduced prey availability (beach invertebrates and wrack line).
- Reduction of potential for formation and maintenance of optimal overwash or bayside piping plover breeding and foraging habitat.
- Disturbance to plovers through enhancing beaches to attract increased recreational activities.
- Habitat destruction and disturbance due to the potential for additional development and stabilization efforts resulting in additional or expanded structures/use.
- Increased predator populations/activity that could utilize habitat created by the project.
- Creation of sub-optimal habitat and potential population sink
- Borrow area habitat degradation and impacts to sea turtle foraging
- Potential disturbance or harm to sea turtles in the borrow area by dredge activity prior to November 15.
- Direct mortality to plovers or amaranth if present during project activities (not anticipated).
- Changes in habitat to existing plover and amaranth habitat on FIIS (could be positive or negative).

Potential beneficial impacts

- Potential significant increase in enhanced beach profile height and width for increased nesting, colonization, germination and foraging habitat

- Potential for ephemeral pool creation and less scarping.
- Decrease probability of loss of productivity or mortality due to flooding.

Table 7 Potential effects of beach nourishment on special status species

Common Name (Scientific Name)	Status*	Potential Effect
Piping plover (*Charadrius melodus*)	FT, SE	Moderate negative or positive effect. Beach nourishment would result in a wider beach with more foraging and nesting habitat. Since birds are not in area during construction time, no direct adverse impacts anticipated. Surveys, monitoring and USFWS protocol will be followed. Potential indirect negative effects: preclusion of natural and overwash habitat, creation of sink/ sub-optimal habitat, burial/manipulation of prey base, increased recreational and predation impacts. Potential to adversely effect, although plovers were not observed nesting in the communities/action area for the period of 1984-2002;
Least tern (*Sterna antillarum*)	ST	Not likely to adversely effect. Data suggests that least terns could use the action area for nesting, but it is not likely due to narrow beach width and heavy human use. Potential positive and negative effects similar to plover
Common tern (*Sterna hirundo*)	ST	Not likely to adversely effect. Construction is expected to have no effect, as this species is unlikely to occur in the action area. Potential positive effects: creation of suitable habitat for loafing and resting. Potential positive and negative effects similar to plover
Kemp's ridley sea turtle (*Lepidochelys kempii*)	FE, SE	Potential to but not likely to adversely effect. Species has not been documented in action area during proposed project activity period. NMFS conservation measures will be followed to avoid and minimize impacts. Safety windows and equipment selection will avoid and minimize impacts. Potential for indirect habitat impacts.
Leatherback sea turtle (*Dermochelys coriacea*)	FE, SE	Potential to but not likely to adversely effect. Species has not been documented in action area during proposed project activity period. NMFS conservation measures will be followed to avoid and minimize impacts. Safety windows and equipment selection will avoid and minimize impacts. Potential for indirect habitat impacts.
Atlantic green sea turtle (*Chelonia mydas*)	FT, ST	Potential to but not likely to adversely effect. Species has not been documented in action area during proposed project activity period. NMFS conservation measures will be followed to avoid and minimize impacts. Safety windows and equipment selection will avoid and minimize impacts. Potential for indirect habitat impacts.
Loggerhead sea turtle (*Caretta caretta*)	FT, ST	Potential to but not likely to adversely effect. Species has not been documented in action area during proposed project activity period. NMFS conservation measures will be followed to avoid and minimize impacts. Safety windows and equipment selection will avoid and minimize impacts. Potential for indirect habitat impacts.
Sei whale (*Balaenoptera*	FE, SE	Potential to but not likely to adversely effect. Species has not been documented in action area during proposed project

Common Name (Scientific Name)	Status*	Potential Effect
borealis)		activity period. NMFS conservation measures will be followed to avoid and minimize impacts. Safety windows and equipment selection will avoid and minimize impacts. Potential for indirect habitat impacts.
Finback whale (*Balaenoptera physalus*)	FE, SE	Potential to but not likely to adversely effect. Species has not been documented in action area during proposed project activity period. NMFS conservation measures will be followed to avoid and minimize impacts. Safety windows and equipment selection will avoid and minimize impacts. Potential for indirect habitat impacts.
Humpback whale (*Megaptera novaeangliae*)	FE, SE	Potential to but not likely to adversely effect. Species has not been documented in action area during proposed project activity period. NMFS conservation measures will be followed to avoid and minimize impacts. Safety windows and equipment selection will avoid and minimize impacts. Potential for indirect habitat impacts.
Northern right whale (*Eubalaena glacialis*)	FE, SE	Potential to but not likely to adversely effect. Species has not been documented in action area during proposed project activity period. NMFS conservation measures will be followed to avoid and minimize impacts. Safety windows and equipment selection will avoid and minimize impacts. Potential for indirect habitat impacts.
Harbor porpoise (*Phocoena phocoena*)	SC	Potential to but not likely to adversely effect. Species has not been documented in action area during proposed project activity period. NMFS conservation measures will be followed to avoid and minimize impacts. Safety windows and equipment selection will avoid and minimize impacts. Potential for indirect habitat impacts.
Seabeach amaranth (*Amaranthus pumilus*)	FE, SE	Moderate negative or positive effect. Beach nourishment could result in mortality to plants or burial of seed bank if conducted outside of safety window or protocol. USFWS guidelines will be followed to avoid, minimize and compensate, including surveying, fencing and monitoring. Scraping could result in a wider beach with potential for increased habitat for colonization but also accompanying human use/recreation.
Seabeach knotweed (*Polygonum glaucum*)	SC	Moderate negative or positive effect. Beach nourishment could result in mortality to plants or burial of seed bank if conducted outside of safety window. USFWS guidelines will be followed to avoid, minimize and compensate, including surveying, fencing and monitoring. Scraping could result in a wider beach with potential for increased habitat for colonization but also accompanying human use/recreation.

*FE = federally endangered *SE = State endangered
*FT = federally threatened *ST = State threatened
*SC = State species of special concern

Cumulative Effects

There is the unlikely potential for all Fire Island communities to beach nourish during the project timeframe. This could result in almost 6 miles of beach manipulation with the impacts discussed above, with additional one-mile adjacent westerly buffers and 1000' easterly buffers of indirect impacts from potential littoral drift and sand movement from the project sites. Taking this into consideration, the potential for indirect impacts could span from the Fire Island Lighthouse Visitor Center Area on the West to the Watch Hill Visitor Center on the West. Additionally, the ACOE FIMP project and its associated reach projects are ongoing and planned for Shinnecock and Westhampton. This could result in additional shoreline stabilization along Fire Island during the scope of this project. The Fire Island Pines Dredging project has been proposed and may occur within the year. Additional FIIS and community projects may also be proposed within the project life that may or may not have additional effects to this or the surrounding area, but cannot be predicted at this time.

Conclusion
The beach nourishment alternative could affect federally or state-listed species of concern either positively or negatively, both directly and indirectly, depending upon the timing and extent of projects and the severity of storm/weather conditions. Because NPS criteria require survey and monitoring and other conservation measures as a permit condition, and would not allow projects to occur if species were present, no direct impacts are anticipated. Indirect impacts, however, could adversely or positively affect the plover and amaranth. Nourishment can affect species habitat both within the project areas as well as adjacent shoreline due to sediment transport. FIIS would continue to operate under its Endangered Species Management Plan, which incorporates measures to protect species of concern, and would continue to report the results of its inventory and monitoring program to the USFWS and NYSDEC.

Alternative D. Preferred Alternative - Impacts
Similar impacts to those of both Alternative B and C are expected for Alternative D. However, if both scraping and nourishment activities occur along the same shoreline from 2003 to 2005, then effects of Alternatives B and C could be cumulative. Alternative D, the potential combination of Alternatives B and C could be expected to represent the combined effects of B and C under the most severe scenario. Conversely, the use of beach nourishment may preclude the need for and use of beach scraping by some communities.

However, since each of the action alternatives (B-D) were designed to occur within a safety window with all activity occurring during times when the rare species were not present, direct impacts are expected to be avoided. These alternatives have the potential to increase the available habitat at the community sites where these species have historically been absent. There is always a chance that a rare plant or animal species may accidentally occur during project activity, but surveys and monitoring protocol should determine this and immediately trigger species protection and project modification.

Essential Fish Habitat

Alternative A, No action Impacts
No impacts to Essential Fish Habitat (EFH) are expected under the no action alternative since only natural events would take place.

Alternative B, Beach Scraping Impacts
Impacts from beach scraping are expected to be localized and short term, as disturbance will occur above the high water mark. It is anticipated that there is at most a negligible, short-term effect on EFH in the intertidal and near shore environment during storm events, as this is a high-energy zone with mixing and transport of sediment with each wave and tidal cycle. It is anticipated that the area's water quality for EFH will not be affected and that any potential disturbance would be minimal and temporary, quickly returning to normal within a tide cycle after the storm event.

No cumulative impacts are expected, as no significant EFH effects are apparent from past years of this activity, since it occurs outside of the potentially effected aquatic zone.

Alternative C, Beach Nourishment Impacts
Long-term impacts to water quality are not expected to occur as a result of project implementation. Short-term turbidity may affect EFH in several ways. Settling of sediments may bury demersal species or life stages. Suspended matter can clog gills and filter-feeding structures, which could directly cause mortality or reduce energy efficiency, and cause indirect effects such as reduction in reproduction or decreased ability to avoid predation (Sherk 1971). In addition, turbidity may temporarily reduce light penetration, lowering photosynthetic activity and dissolved oxygen content. Turbidity and associated water quality parameters at the borrow areas and placement sites will rapidly return to preconstruction levels with no lingering adverse impacts expected (Naqvi and Pullen, 1982). Therefore, impacts to EFH in the borrow area are expected to be minor to moderate and short-term. Impacts near the fill site are expected to be negligible to minor, and short-term due to temporary increases in turbidity, as this is a high-energy zone with mixing and transport of sediment with each wave and tidal cycle.

No Cumulative Impacts are anticipated to EFH, as the short-term impacts of each project would have dissipated due to natural processes.

Table 8. Potential effects on species for which an essential fish habitat (EFH) has been designated.

Species	Potential Effects
American plaice (Hippoglossoides platessoides)	No effect. Species has not been documented in the project area.
Atlantic butterfish (Peprilus triacanthus)	Low to moderate effect. Eggs and larvae are found in low numbers in the project area July-August. Juveniles and adults are found in the project area in low numbers in summer and high numbers in fall; they then migrate to offshore waters. Dredging during winter months will not impact any life stages. Dredging in September may have minor impacts on the juvenile recruitment in the project area.
Atlantic cod (Gadus morhua)	No effect. Species has not been documented in the project area.
Atlantic mackerel (Scomber scombrus)	Low to moderate effect. Eggs and larvae were not found in the project area, although they were found in areas adjacent to the project area in high numbers. Juveniles and adults are found in small numbers in both the summer and winter. The mobility of both juveniles and adults will produce negligible, if any, effects during dredging.
Atlantic salmon (Salmo salar)	No effect. The mobility of adults will enable them to avoid dredging area.
Atlantic herring (Clupea harengus)	No effect. Juveniles and adults are found in the project area during the winter and spring at depths of 30-90m, with highest concentrations in spring. Dredging occurs at depths of 11-16m, and is expected to have no effect.
Atlantic sea scallop (Placopecten magellanicus)	No effect. Species has not been documented in the project area.
Black sea bass (Centropristus striata)	No effect. Larvae, juveniles, and adults occur in areas with structures such as reefs and shipwrecks. They do not occur over sandy substrates, such as found in the project area. Therefore, no effect is expected for this species.
Bluefin tuna (Thunnus thynnus)	No effect. The mobility of juveniles and adults will enable them to avoid the dredging area.
Bluefish (Pomatomus saltatrix)	No effect. Juveniles occur mainly in the fall in estuaries and bays of the Middle Atlantic Bight, as well as the coastal waters of the project area. Adults occur in the project area in relative abundance. Bluefish are found only in water temperatures of 14-16 degrees Celsius. Dredging during winter is not likely to effect species, due to low water temperatures (<14 degrees Celsius) and mobility of juveniles and adults.
Blue shark (Prionace glauca)	No effect. Pups, juveniles and adults are found in shallow coastal waters and offshore in the open ocean. Blue sharks at all life stages are highly mobile; therefore dredging is not likely to affect any life stage.
Cobia (Rachycentron canadum)	No effect. No specimens have been documented in the project area.
Common thresher shark (Alopius vulpinus)	No effect. Threshers are pelagic species that move to coastal waters to feed on schooling fish. Since all life stages are mobile and schooling fish will likely be displaced out of the project area, thresher sharks are not likely to be impacted.
Dusky shark (Carcharhinus obscurus)	No effect. Species has not been documented in the project area.

Species	Potential Effects
Haddock (Melanogrammus aeglefinus)	No effect. Species has not been documented in the project area.
King mackerel (Scomberomorus cavalla)	No effect. Eggs and larvae were not found in the project area, although they were found in areas immediately adjacent to the project area in high numbers. Juveniles and adults are found in small numbers in both the summer and winter. Dredging is not likely to effect species, due to ability to move from dredge area.
Long-finned squid (Loligo pealei)	No effect. Both juveniles and adults are found in small numbers in the nearshore waters of the project area during spring and summer months, then migrate to deeper waters offshore during fall and winter. Dredging will occur in during winter months, and is therefore not likely to impact species.
Monkfish (Lophius americanus)	No effect. There is little information regarding egg distribution, but it suggests they are rare in the project area. Larvae are also rare in the project area; they occur June-September in offshore waters at depths of 30-90m. Dredging will occur during winter months at depths of 11-16m, and will not impact species.
Ocean pout (Macrozoarces americanus)	No effect. There is no data on the distribution of eggs at this time. Larvae are not found in the project area. Adults are seen in the project area in winter and spring, but are expected to move from the area during dredging operations.
Pollack (Pollachius virens)	No effect. Species has not been documented in the project area.
Red hake (Urophycis chuss)	No effect. Spawning occurs in the summer, and eggs are seen in the project area July-October. Larvae are not present in the project area. Juveniles are seen all year in low numbers, but are likely to avoid dredging activity.
Sand tiger shark (Odontaspis taurus)	No effect. The mobility of all life stages will enable sand tiger sharks to avoid dredging area.
Sandbar shark (Carcharhinus plumbeus)	No effect. Species has not been documented in the project area.
Scup (Stenotomus chrysops)	No effect. Juveniles are present in the project area from May to November. Adults occur in the project area in spring through fall, then migrate to offshore waters. Dredging will not impact species, due to mobility of juveniles and adults.
Shortfin mako shark (Isurus oxyrinchus)	No effect. No specimens have been documented in the project area.
Skipjack tuna (Euthynnus pelamis)	No effect. Species has not been documented in the project area. Specimens inhabit waters with temperatures of 20 degrees Celsius. Dredging during winter months will occur with temperatures < 14 degrees Celsius.
Spanish mackerel (Scomberomorus maculates)	No effect. Eggs and larvae were not found in the project area, although they were found in areas immediately adjacent to the project area in high numbers. Juveniles and adults are found in small numbers in both the summer and winter. Dredging is not likely to effect species, due to mobility of both juveniles and adults.
Spiny dogfish (Squalus acanthis)	No effect. Species has not been documented in the project area.
Summer flounder (Paralicthys dentatus)	No effect. Juveniles are found in the project area in low numbers in the fall. Adults are found in the project area in higher numbers in the fall. Dredging will take place in winter, when summer flounder are not found in the area.

Species	Potential Effects
Tiger shark (Galeocerdo cuvieri)	No effect. Species has not been documented in the project area.
Tilefish (Lopholatilus chamaeleonticeps)	No effect. Species has not been documented in the project area.
White hake (Urophycis tenuis)	No effect. Species has not been documented in the project area.
White shark (Charcharodon carcharius)	No effect. Species has not been documented in the project area.
Whiting (Meriuccius bilinearis)	No effect. Eggs and larvae have not been documented in the project area. Juveniles were documented in the project area in spring and fall in high numbers and summer in low numbers. Adults were present in the spring in high numbers and winter in low numbers adjacent to the project site. Whiting are not expected to occur in the project area; however, if they do, they are very mobile and will likely avoid dredging activity, causing no effect.
Windowpane flounder (Scopthalmus aquosus)	Minor impact on eggs. Eggs are present February-November in nearshore waters; densities peak in May and October. Larvae and juveniles occur nearshore at depths <50m throughout the year. Adults are present in nearshore waters during spring through autumn, and migrate to deeper waters during winter.
Winter flounder (Pleuronectes americanus)	No effect. All life stages are found in the protected estuary of Great South Bay throughout the year. Adults migrate to the cooler ocean waters during summer months, and travel back into the bay to spawn in the winter.
Witch flounder (Glyptocephalus cynoglossus)	No effect. Species has not been documented in the project area.
Ocean quahog (Arctica islandica)	No effect. Recruits are found in small numbers in the project area during summer months. Therefore, dredging during winter is not likely to have an effect. Adults present in the area being dredged will be removed.
Surf Clam (Spisula solidissima)	Short-term, negligible effect. Pre-recruits and recruits occur in low numbers in the project area. Dredging during winter is not likely to affect the surf clam pre-recruit or recruit abundance as population densities are low. Adults present in the area being dredged will be removed.

Alternative D. Preferred Alternative - Combination of scraping and nourishment project Impacts

The impacts of Alternative D are expected to be the same as Alternative C.

Vegetation and Wetland Habitats

Alternative A, No action Impacts

No impacts are anticipated.

Alternative B, Beach Scraping Impacts

Minor to moderate impacts are anticipated at the local scale but these impacts will be reduced at larger scales outside of the communities. A major adverse effect from beach scraping involving any use of heavy equipment within 20 feet of the rhizomes of any existing beach grasses is that they will be sheared by the heavy equipment operating in the area. Scientific analysis has uncovered that rhizomes can be sheared with a single pass of an off-road vehicle, and all rhizomes were sheared after five passes (Leatherman and Allen, 1985). Furthermore, the burial of existing vegetation under sufficient sand to prevent existing grasses from growing upward will retard the development of a web of rhizomes which would hold accreting sand in place. Rhizomes have developed through three vertical feet of sand, but some of the proposals probably will entail creating sand piles significantly higher than that (Allen, personal communication). Beach grass planted on top of an artificially created mound of sand, while more effective at trapping the sand than nothing, is ineffective under serious storm conditions because it does not rest upon a web of rhizomes creating a structure through the dune. The impacts of beach scraping should be studied more fully as some coastal experts have indicated that the effects are, at best, neutral (Allen, personal communication).

Alternative C, Beach Nourishment Impacts

Minor to moderate impacts are anticipated at the local scale but these impacts will be reduced at larger scales outside of the communities. A major adverse effect from building new dunes involving any use of heavy equipment within 20 feet of the rhizomes of any existing beach grasses is that they will be sheared by the heavy equipment operating in the area. Scientific analysis has uncovered that rhizomes can be sheared with a single pass of an off-road vehicle, and all rhizomes were sheared after five passes (Leatherman and Allen, 1985). Furthermore, the burial of existing vegetation under sufficient sand to prevent existing grasses from growing upward will retard the development of a web of rhizomes which would hold accreting sand in place. Rhizomes have developed through three vertical feet of sand, but some of the proposals probably will entail creating sand piles significantly higher than that (Allen, personal communication). Beach grass planted on top of an artificially created mound of sand, while more effective at trapping the sand than nothing, is ineffective under serious storm conditions because it does not rest upon a web of rhizomes creating a structure through the dune.

For the dominant floral species, this should not be considered a major negative impact, as beach-dwelling plant communities are composed of pioneer species and adapted to disturbance and dynamic substrate and environmental conditions. These plant communities typically revegetate areas of open sand created during natural overwash events within one to three years (ACOE, 1999). Similarly, prompt natural revegetation of the deposited sand after the completion of the renourishment project is expected. In addition, some slight changes in vegetation distribution may be expected in the backdune and swale areas due to the increase in primary dune height and volume resulting from these projects. Primary dunes act to shelter vegetation in backdune and swale areas from wind-blown salt and sand. Therefore, by increasing the height of the dune, backdune habitats will become more favorable for woody plant species, such as beach plum and rugosa rose (*Rosa rugosa*), and an increase in abundance of these species is plausible. The nourishment projects will be accompanied by dune grass plantings at varying density to simulate habitat for plover and amaranth.

Negligible, similar impacts are expected to these upland communities under each action alternative, except in the case of serious storm erosion, then in all cases, these upland communities would be damaged or lost. However, this is considered a natural process in barrier island dynamics as it migrates and rolls back on itself.

In much of the project area natural habitat has been replaced with human dwellings and many species of vegetation that are exotic to Fire Island. Plant species such as bamboo, autumn olive, Japanese black pine, nodding thistle, bittersweet and Japanese honeysuckle are current examples of some of the invasive exotic species identified on Fire Island (NPS, 2003) that were introduced by humans either as intentionally planted ornamentals or were accidentally introduced as weeds. Within this man-made environment all plant species, both native and exotic, are able to grow because of the salt spray protection afforded by the human dwellings acting as artificial dunes.

Alternative D. Preferred Alternative - Impacts
Same as B and C.

Wildlife and Wildlife Habitat

Alternative A, No action Impacts
No impacts are anticipated.

Alternative B, Beach Manipulation/Scraping Impacts
Negligible to minor, short term impacts are anticipated. Seventeen species of terrestrial mammals were identified on Fire Island during surveys conducted by McCormick in 1974. Common species identified in the survey include white-tailed deer (*Odocoileus viginianus*), eastern cottontail (*Sylvilagus floridanus*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), masked shrew (*Sorex cinereus*), short-tailed shrew (*Blarina brevicauda*), muskrat (*Ondatra zibethica*), weasel (*Mustela* spp.), white-footed mouse (*Peromyscus leucopus*), and Norway rat (*Rattus norvegicus*). The little brown bat (*Myotis lucifugus*) is the most common bat observed in the area. Feral cats and dogs are also present (U.S. Army Corps of Engineers [ACOE] 1999). No effects are anticipated on mammals.

Eight reptile and two amphibian species occur on Fire Island National Seashore. Fowler's toad (*Bufo woodhousei*)and the bullfrog (*Rana catesbeiana*) are the only identified amphibian species. Reptiles identified include eastern mud turtle (*Kinosternon subrubrum subrubrum*), spotted turtle (*Clemmys guttata*), northern diamondback terrapin (*Malaclemys terrapin terrapin*), snapping turtle (*Chelydra serpentina*), eastern box turtle (*Terrapene carolina*), eastern garter snake (*Thamnophis sirtalis*), and northern black racer (*Coluber constrictor constrictor*) (USACE 1999). No effects are anticipated on mammals.

More than 330 species of birds have been identified on Fire Island National Seashore (see Table 7 for the most common). Fire Island is located along the Atlantic flyway for shorebirds, waterfowl, and other birds that nest in the north and migrate south for the winter. The salt marshes, beaches, and dunes on the island are nesting places for various species of plovers (*Charadrius* spp.), gulls (*Larus* spp.), terns (*Sterna* spp.), geese (*Branta* spp.), herons (*Ardea* spp.), and ducks (*Anas* spp.). The American oystercatcher (*Haematopus palliatus*) and black skimmer (*Rynchops niger*) are two migratory species that are known to breed in the salt marshes and barrier beaches of Fire Island. The federally threatened piping plover (*Charadrius melodus*) and the New York threatened least tern (*Sterna antillarum*) also nest on the island. Minor impacts on the piping plovers are anticipated but will be reduced by implementing the FWS conservation measures.

Alternative C, Beach Nourishment Impacts

Minor to Moderate, short-term impacts are anticipated. Seventeen species of terrestrial mammals were identified on Fire Island during surveys conducted by McCormick in 1974. Common species identified in the survey include white-tailed deer (*Odocoileus viginianus*), eastern cottontail (*Sylvilagus floridanus*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), masked shrew (*Sorex cinereus*), short-tailed shrew (*Blarina brevicauda*), muskrat (*Ondatra zibethica*), weasel (*Mustela* spp.), white-footed mouse (*Peromyscus leucopus*), and Norway rat (*Rattus norvegicus*). The little brown bat (*Myotis lucifugus*) is the most common bat observed in the area. Feral cats and dogs are also present (U.S. Army Corps of Engineers [ACOE] 1999). No effects are anticipated on mammals.

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Alternative D. Preferred Alternative - Combination of scraping and nourishment project Impacts
Alternative D is expected to have the same effects of B and C. These effects are not expected to be cumulative since the communities would not likely impose scraping after a nourishment project until the dune had eroded to below the criteria established thus preventing it from happening immediately after the nourishment project.

Human Environment

Air Quality

Alternative A, No action Impacts
No impacts are anticipated.

Alternative B, Beach Manipulation/Scraping Impacts
Negligible, short-term impacts are anticipated.

Alternative C Beach Nourishment Impacts
Minor to moderate, short-term impacts are anticipated. Pollutant emissions, particularly nitrogen oxides from the vehicles and dredging equipment, may adversely affect air quality, but only on a temporary and insignificant basis. These compounds react with sunlight to form ozone. Fire Island National Seashore is in an area classified by the Environmental Protection Agency as in severe non-attainment for ozone. See the attached Record of Non-applicability.

Alternative D. Preferred Alternative - Combination of scraping and nourishment project Impacts
Same as C.

Visual and Scenic Aesthetic Values

Alternative A, No action Impacts
No impacts from the No Action Alternative are expected because it allows natural processes to continue. Therefore, the garnet and magnetite sands valued by visitors and residents will continue to be deposited. No cumulative effects are expected.

Alternative B, Beach Manipulation/Scraping Impacts
Impacts from beach scraping are expected to be short-term and moderate. Effects would be localized in nature and the garnet and magnetite sands would be redeposited within a relatively short amount of time as natural littoral processes replenish it. No cumulative effects are anticipated. Loss of the natural beach contour as well as the loss of vegetation on the dunes are expected to have minor aesthetic impacts.

Alternative C Beach Nourishment Impacts
Beach nourishment activities may cause moderate short-term impacts similar to those expected as a result of beach scraping. Wave and wind action will redeposit and rearrange sand particles to expose garnet and magnetite. No cumulative effects are expected. Loss of the natural beach contour as well as the loss of vegetation on the dunes are expected to have minor aesthetic impacts.

Alternative D. Preferred Alternative - Combination of scraping and nourishment project Impacts
Impacts of Alternative D are anticipated to be the same as those for Alternatives B and C.

Soundscapes

Alternative A, No action Impacts
No impacts are anticipated

Alternative B, Beach Manipulation/Scraping Impacts
Negligible, short-term impacts are anticipated. The main cause of noise during the placement of sand is the operation of the bulldozers.This source is short-term with relatively low decibel levels and no long-term or cumulative noise impacts are anticipated.

Alternative C Beach Nourishment Impacts
Negligible, short-term impacts are anticipated. The main cause of noise during the placement of sand is the operation of the bulldozers. This source is short-

term with relatively low decibel levels and no long-term or cumulative noise impacts are anticipated.

Alternative D. Preferred Alternative - Combination of scraping and nourishment project Impacts

Negligible, short-term impacts are anticipated. The main cause of noise during the placement of sand is the operation of the bulldozers. This source is short-term with relatively low decibel levels and no long-term or cumulative noise impacts are anticipated.

Historic and Archeological Resources

Alternative A, No action Impacts

No impacts are expected on cultural resources of the area since surveys indicate that none are expected to occur in the area. In the unexpected event that any were discovered, NPS would protect them as mandated by Federal and State Cultural and Historic Preservation Laws.

Alternative B, Beach Scraping Impacts

No impacts are expected on cultural resources of the area since surveys indicate that none are expected to occur in the area. In the unexpected event that any were discovered, NPS would protect them as mandated by Federal and State Cultural and Historic Preservation Laws.

Alternative C, Beach Nourishment Impacts

No impacts are expected on cultural resources of the area since surveys indicate that none are expected to occur in the area. In the unexpected event that any were discovered, NPS would protect them as mandated by Federal and State Cultural and Historic Preservation Laws.

Alternative D. Preferred Alternative - Combination of Scraping and Nourishment Project Impacts

No impacts are expected on cultural resources of the area since surveys indicate that none are expected to occur in the area. In the unexpected event that any were discovered, NPS would protect them as mandated by Federal and State Cultural and Historic Preservation Laws.

Socioeconomics

Alternative A, No action Impacts

Alternative A is expected to have long-term, moderate to major negative effects on the socioeconomic environment in FIIS since there is a potential for structural damage and loss of homes and businesses on Fire Island due to the natural beach dynamics. This natural dynamic beach process is what complicates the beach manipulation projects like any of the action alternatives. With no project economic activity and utility services could be disrupted. Taking no action could also have a significant negative effect on the commercial enterprises in the project area.

The No Action Alternative makes no assumption in an event of a catastrophic storm or that of a barrier island breach occurring.

Alternative B, Beach Manipulation/Scraping Impacts
Alternative B is expected to have short-term moderate to major positive impacts on the socioeconomics of Fire Island. Beach scraping activities harvest and redistribute sand to provide for an augmented dune face, which will then provide less beach area for recreation and access on the project sites. Without sand redistribution by scraping, there may be more chance of impacts to houses behind the dunes, but it is suspected that the created dunes are not as stable as natural dunes (Psuty, et al, 2002). This may mislead landowners into a false sense of security when their property remains in a coastal erosion hazard area.Significant socioeconomic benefits for the real estate and business markets could be expected because of the increased height and width of the dunes. However, no project can be approved unless adequate mechanisms are in place to prevent currently unbuildable lots from qualifying as buildable ones.

No cumulative impacts are expected since these projects are short-term and localized in nature, although more than one project could be expected over the 2.5 year course of the project.

Alternative C, Beach Nourishment Impacts
Without analyzing the expeditures associated with beach nourishment, which is coming from private sources, Alternative C is expected to have long-term moderate positive impacts on the socioeconomic environment of Fire Island. Beach changes on Fire Island could be reduced locally and in the short term in the areas in front of the communities which are proposed for these projects. The placement of beach fill in the designated areas would protect the residential, recreational, and commercial uses.

Similar cumulative impacts could be expected, as the positive impacts of renourishment on FI 's tourism and real-estate-based economy are expected to last beyond one year although the widened beach is expected to erode within a few years. However, no project can be approved unless adequate mechanisms are in place to prevent currently unbuildable lots from qualifying as buildable ones.

Alternative D. Preferred Alternative - Combination of scraping and nourishment project Impacts
Alternative D is expected to have the same long-term moderate to major positive impacts on the Socioeconomics of FI as Alternative C. Potentially more positive impacts may occur to recreation if any scraping projects occur within the project time frame, as effects could be considered additive. Beach erosion on Fire Island

could be reduced locally in the areas proposed for renourishment. The placement of beach fill in the designated areas would protect the residential, recreational, and commercial uses.

Cumulative impacts could be expected, as the positive impacts of renourishment on FI's tourism and real estate based economy are expected to last beyond one year, and potentially more than one project could occur during the scope of this project time-frame. However, no project can be approved unless adequate mechanisms are in place to prevent currently unbuildable lots from qualifying as buildable ones.

Recreation and Public Use

Alternative A, No action Impacts
Under the No Action Alternative, reduced beach areas in front of the houses could have negative impacts. According to an ACOE New York District study (1997), beach use in the study area has declined due to beach shoreline change. Under the No Action Alternative, beach shoreline change is likely to continue at varying rates in the placement area. This would result in reduced beach frontage, and lost recreational opportunities for visitors and residents of Long Island who rely on the public beaches for a significant portion of their recreation.

Alternative B, Beach Scraping Impacts
Alternative B is expected to have short-term minor negative to positive impacts on recreation and public use. Beach scraping activities harvest and redistribute sand taking away from the existing beach to provide for an augmented dune face. At the same time, without sand harvest and redistribution by scraping, continued shoreline change would limit the area of and access to the beach and lower the user value of the area.

No cumulative impacts are expected since these projects are short-term and localized in nature, although more than one project could be expected over the timeframe of the project.

Alternative C, Beach Nourishment Impacts
Alternative C is expected to have long-term moderate positive impacts on recreation and public use. Beach erosion on Fire Island could be reduced locally in the areas proposed for renourishment. The placement of beach fill in the designated areas would protect the residential, recreational, and commercial uses.

During construction and fill, however, a certain amount of short-term disruption is unavoidable. This disturbance is anticipated to be temporary and minor, since these activities are restricted to the time period of low recreation use (September- February). Expected disturbance would primarily include access to the beach, interruption of pedestrian routes along the beach, and noise from trucks and other heavy machinery.

Cumulative impacts could be expected, as the positive impacts of renourishment on recreation are expected to last beyond one year, and potentially more than one project is expected during the scope of this project time-frame.

Alternative D. Preferred Alternative - Combination of scraping and nourishment impacts

Alternative D is expected to have the same long-term moderate positive impacts on recreation and public use as Alternative C. Shoreline change on Fire Island could be reduced locally in the areas proposed for renourishment. The placement of beach fill in the designated areas would protect the residential, recreational, and commercial uses. This beach would eventually migrate west down the island which could create more suitable habitat areas for public recreation.

During construction and fill, however, a certain amount of short-term disruption is unavoidable. This disturbance is anticipated to be temporary and minor, since these activities are restricted to the time period of low recreation use (October-February).

Cumulative impacts could be expected, as the positive impacts of renourishment on recreation are expected to last beyond one year, and potentially more than one project is expected during the scope of this project time-frame.

National Seashore Management and operations

Alternative A, No action Impacts

No action is expected to result in NPS dealing with increased pressure from communities for storm damage protection and potential for access route change or restrictions.

Alternative B, Beach Manipulation/Scraping Impacts

Impacts to NPS operations from Alternative B are expected to be short-term and minor to moderate in nature. Increased manpower for beach construction activities, although temporary, are expected to result in increased need for NPS monitoring for project compliance for design criteria and T & E species. No cumulative impacts are expected unless T & E species become established, in which case additional staffing will be required.

Alternative C Beach Nourishment Impacts

Impacts to NPS operations from Alternative C are expected to be potentially long-term and minor to moderate in nature. Increased manpower for beach construction activities, although temporary, is expected to result in increased need for NPS monitoring for project compliance for design criteria and T & E species. No cumulative impacts are expected unless T & E species become established, in which case these species will be monitored.

Alternative D. Preferred Alternative - Combination of scraping and nourishment project Impacts

Impacts to NPS operations from Alternative D are expected to be a combination of B and C: long-term and minor to moderate in nature. Increased manpower for beach construction activities, although temporary, is expected to result in increased need for NPS monitoring for project compliance for design criteria and T & E species. No cumulative impacts are expected unless T & E species become established, in which case additional staffing will be required.

AFFECTED ENVIRONMENT SUMMARY

Table . 9 Summary of Impacts to affected Environments

Affected Environment	Alternative A – No Action	Alternative B – Beach Scraping	Alternative C – Beach Nourishment	Alternative D – Combination of B and C
Natural Resources				
Marine Resources: Offshore Environment (Borrow Area) and Aquatic Life	No impacts anticipated.	No impacts anticipated.	Moderate, short-term impacts due to increased turbidity and destruction by dredging equipment. No cumulative impacts are anticipated.	Same as Alternative C.
Marine Resources: Water Quality	No impacts anticipated. Water quality conditions will remain unchanged, responding to existing natural and human-induced conditions.	Negligible to minor, short term impacts could occur from wave washup over newly moved sand as sediment in water column causes increase in	Short-term, moderate impacts are expected due to increased turbidity. No long-term or cumulative impacts are anticipated.	Same as Alternative B & C.

Affected Environment	Alternative A – No Action	Alternative B – Beach Scraping	Alternative C – Beach Nourishment	Alternative D – Combination of B and C
	No short- or long-term or cumulative effects are expected.	turbidity immediately seaward of the project beach.		
Shoreline Processes	No cumulative impacts are anticipated.	Negligible to minor short-term impacts as sand removal would be very localized. No cumulative impacts are anticipated as long as there are no additional structures added on the dune line.	Minor to moderate long-term impacts are expected. Minor cumulative impacts are expected due to the long-term nature of renourishment as long as no structures are added along the dune line.	Combination of Alternatives B and C.
Beach Ecosystem	No impacts.	Minor short-term, localized impacts.	Minor to moderate long-term impacts	Same as both B & C.
Special Status Species	See Table # 5.	See Table # 6.	See Table # 7.	See Tables 6 & 7.
Essential Fish Habitat	See Table # 8.	See Table # 8.	See Table # 8.	See Table # 8.
Vegetation and Wetland Habitats	No impacts.	Minor to moderate impacts due to rhizomes being crushed and grasses being covered.	Minor to moderate impacts due to rhizomes being crushed and grasses being covered.	Same as B & C.
Wildlife and Wildlife Habitats	No impacts.	Negligible to minor impacts from the dune	Minor to moderate impacts from	Same as B & C.

Affected Environment	Alternative A – No Action	Alternative B – Beach Scraping	Alternative C – Beach Nourishment	Alternative D – Combination of B and C
		manipulations.	the created beach and dunes.	
Human Environment				
Air Quality.	No impacts.	Negligible impact.	Minor to moderate impacts offshore with no violating of the state implementation plan.	Same as B & C.
Visual and Scenic Values	No impacts anticipated.	Short-term moderate negative impacts as garnet and magnetite sands are covered. No cumulative effects are expected.	Short-term moderate negative impacts as garnet and magnetite sands are covered. No cumulative effects are expected.	Short-term moderate negative impacts as garnet and magnetite sands are covered. No cumulative effects are expected.
Soundscapes	No impacts.	Negligible impact.	Negligible impact.	Negligible impact.
Historic and Archeological Resources	No impacts are expected on cultural resources of the area.	No impacts are expected on cultural. . Protecting the communities with increased sand volume in the dunes will protect resources in the communities.	No impacts are expected on cultural resources. Protecting the communities with increased sand volume in beaches and dunes will protect the resources in the communities. If archaeological	No impacts are expected on cultural resources. Protecting the communities with increased sand volume in beaches and dunes will protect the resources in the communities. If archaeological

Affected Environment	Alternative A – No Action	Alternative B – Beach Scraping	Alternative C – Beach Nourishment	Alternative D – Combination of B and C
			resources are found they will be protected as discovered.	resources are found they will be protected as discovered.
Socioeconomic Environment	Moderate to major, long-term negative impact through reduction in the width of beach and decrease in visitor use.	Dune height may protect buildings behind the dune which may have a moderate positive impact.	Short-term moderate positive impacts on recreation and public use.	Short-term moderate positive impacts on recreation and public use. Similar cumulative effects.
Recreation/ Visitor Experience	Moderate long-term reduction in the width of beach and decrease in number of visitors. Similar cumulative effects anticipated.	Short-term minor negative or positive impacts.	Short-term moderate positive impacts on recreation and public use.	Short-term moderate positive impacts on recreation and public use. Similar cumulative effects anticipated.
NPS Management and Operations	No affect.	Short-term and minor to moderate in nature due to regulating the activities.	Short-term and minor to moderate in nature due to regulating the activities.	Short-term and minor to moderate in nature due to regulating the activities.

ENVIRONMENTALLY PREFERRED ALTERNATIVE -

The no action is the environmentally preferred alternative. Regardless of whether any of the action alternatives are implemented, in the event of a catastrophic storm very significant damage to structures and possibly human safety are predicted, since the entire Island lies within the 100 year flood plain. Therefore, even no action has negative environmental consequences since, during catastrophic storm events, no action will probably mean a loss of property and potentially even human life. Since the No Action alternative does not meet the needs of the the communities, it is not the socially preferred alternative.

Therefore, Fire Island National Seashore, with support of this environmental assessment and the data presented herein, proposes to allow communities to develop plans for privately funded beach scraping, nourishment, and a combination of both, as a means to protect themselves from storm events until the Fire Island to Montauk Point Reformulation Plan for Storm Protection is completed. These plans will be reviewed by Fire Island National Seashore along with the appropriate Federal, State, and local permits, and Special Use Permits for work inside Fire Island National Seashore will be issued when all conditions have been met.

Of the action alternatives, B appears to have the least impact, while C and D are anticipated to have minor to moderate effects (some negative and others positive) extending beyond a year with the renourishment. It is well documented in literature that the effects of sand nourishment are temporary, recovering usually within 12 months, and that the benefits derived from such activities are also short term, since the geomorphologic dynamic balance of the barrier island system is not being overcome. The long term viability of beach nourishment placed into the intertidal zone and allowed to adhere to vegetated dunes has not been fully studied, but the Cherry Grove situation points to this as a possible way to build more durable and resilient dunes. Since Alternatives B and C clearly serve different functions (B beach maintenance and C beach nourishment) they are designed to be used under different conditions. Alternative D provides the park the flexibility to consider both of these methods as the communities apply for Special Use Permits and NPS reviews each application applying these new criteria and restrictions to these activities. For this reason, Alternative D is believed to provide the best balance to the FIIS in protecting the environment and providing for private community storm damage protection.

IMPAIRMENT STATEMENT

Since the purpose of this impact analysis is solely to look at short term projects (3 years), NPS Management Policies impairment determinations are based solely on this short time frame.

As stated earlier from NPS Management Policies - 4.8.1 Protection of Geologic Processes: The Service will allow natural geologic processes to proceed unimpeded. Geologic processes are the natural physical and chemical forces that act within natural systems, as well as upon human developments, across a broad spectrum of space and time. Such processes include, but are not limited to, exfoliation, erosion and sedimentation, glaciation, karst processes, shoreline processes, and seismic and volcanic activity. Geologic processes will be addressed during planning and other management activities in an effort to reduce hazards that can threaten the safety of park visitors and staff and the long-term viability of the park infrastructure. Intervention in natural geologic processes will be permitted only when:
- Necessary in emergencies that threaten human life and property;

From 4.8.1.1: Shorelines and Barrier Islands
Natural shoreline processes (such as erosion, deposition, dune formation, overwash, inlet formation, and shoreline migration) will be allowed to continue without interference. Where human activities or structures have altered the nature or rate of natural shoreline processes, the Service will, in consultation with appropriate state and federal agencies, investigate alternatives for mitigating the effects of such activities or structures and for restoring natural conditions.
The Service will comply with the provisions of Executive Order 11988 (Floodplain Management) and state coastal zone management plans prepared under the Coastal Zone Management Act of 1972. Any shoreline manipulation measures proposed to protect cultural resources may be approved only after an analysis of the degree to which such measures would impact natural resources and processes, so that an informed decision can be made through an assessment of alternatives. Where erosion control is required by law, or where present developments must be protected in the short run to achieve park management objectives, including high-density visitor use, the Service will use the most effective and natural appearing method feasible, while minimizing impacts outside the target area. New developments will not be placed in areas subject to wave erosion or active shoreline processes unless (1) the development is required by law; or (2) the development is essential to meet the park's purposes, as defined by its establishing act or proclamation, and:

- Steps will be taken to minimize safety hazards and harm to property and natural resources.

Management Policies have been interpreted in this case, to extend short term protection of private property needs until the reformulation, long-term plan, for the South Shore of Long Island is approved.

For each alternative the following Impairment Analyses has been accomplished:

Alternative A. - No Action Alternative – No impairment of park resources is expected.

Alternative B. – Beach Scraping – No Impairment of Park Resources is expected.

Alternative C. – Beach Nourishment – No Impairment of Park Resources is expected.

Alternative D. Preferred Alternative - – Combination of Beach Scraping/Beach Nourishment – No Impairment of Park Resources is expected.

CONSULTATION AND COORDINATION

Coordination with the Following Agencies and Organizations was conducted throughout the project. A series of meetings and follow up correspondences with regulatory agencies as well as community stakeholders were held to collect information and input as well as to provide progress updates. The following agencies/offices participated in or were consulted during the course of the development of this document.

U.S. Fish and Wildlife Service, Long Island Field Office,
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REFERENCES

Allen, James, R. Charles LaBash, Peter V. August, Norbert P. Psuty, 2002, Historical and Recent Shoreline Changes, Impacts of Moriches Inlet, and Relevance to Island Breaching at Fire Island National Seashore, NY. National Park Service, Boston Support Office.

Art, H.W. 1971. Atmospheric Salts in the Functioning of a Maritime Forest Ecosystem. University Microfilms, Michigan. Ph.D. Thesis, Yale University.

Barry A. Vittor and Associates, Inc. 1998. DRAFT Report on Macroinvertebrate Community Assessment. Atlantic Coast of Long Island, Fire Island to Montauk Point, New York. Reformulation Study. Fire Island and West of Shinnecock Interim Storm Damage Protection Projects. Prepared for USACE, N.Y. District.

Boggs, S. Jr. 1987. Principles of Sedimentology and Stratigraphy. Merrill Publishing Co. Ohio.

Burger, J. 1987. Physical and Social Determinants of the Nest-Site Selection in Piping Plover in New Jersey. Condor 89:811-818.

Cape Lookout National Seashore. 1998. 1998 Piping Plover Distribution and Nesting Success. National Park Service, Beaufort, NC. 6 pp, plus tables and figures.

Cerrato, R.M. October 1983. Benthic Borrow area Investigations, South Shore of Long Island, New York. Marine Sciences Research Center, Special Report No. 51. State University of New York, Stony Brook, New York.

Conley, D.C. Personal Communication. August 21, 2000, electronic correspondence to Chris Davis, NPS representative. Assistant Professor, State University of New York. Stony Brook, NY.

Conley, D.C. 2000. Numerical Modeling of Fire Island Storm Breach Impacts Upon Circulation and Water Quality of Great South Bay, NY. Technical Report NPS/BSO-RNR/NRTR/00-10. State University of New York. Stony Brook, NY.

Coutu, S. D., Fraser, J. D., McConnaughey, J. L. and Loegering, J. P. 1990. Piping Plover Distribution and Reproductive Success on Cape Hatteras National Seashore. Unpublished Report, submitted to the National Park Service. 67 pp.

Ellias-Gerken, S. P. 1994. Piping Plover Habitat Suitability on Central Long Island, New York Barrier Islands. M.S. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA. 247 pp.

Ellias-Gerken, S. P. and Fraser, J. D. 1994. Piping Plover Foraging Ecology on Pikes Beach, Southampton, New York. Final Report, submitted to the U.S. Fish and Wildlife Service, Sudbury, MA. 61 pp.

Ellias, S. P., Fraser, J. D., and Buckley, P.A. 2000. Piping Plover Brood Foraging Ecology on New York Barrier Islands. Journal of Wildlife Management 64(2) 9 pp.

1977 *Fire Island National Seashore, General Management Pla*n. Denver Service Center.

Fire Island Ecology. 2000. Concept Description: Fire Island Land Buy-out Program. http://www.firei.org/index.shtml

Franz, D.R. and W.H. Harris. 1988. "Seasonal and Spatial Variability in Macrobenthos Communities in Jamaica Bay, New York. An Urban Estuary." Vol. II, No. 1. P. 15-28.

Goldin, M. R. 1990. Reproductive Ecology and Management of Piping Plover (*Charadrius melodus)* at Breezy Point, Gateway National Recreation Area, New York – 1990. Unpublished Report. Gateway National Recreation Area, Long Island, NY. 16 pp.

Goldin, M. R. and Regosin, J. V. 1998. Chick Behavior, Habitat Use, and Reproductive Success of Piping Plovers at Goosewinig Beach, Rhode Island. Journal of Field Ornithology 6 69(2): 228-234 pp.

The Greeley-Polhemus Group, Inc. 1997. Cultural Resources Study, Fire Island to Montauk Point, Suffolk County, New York, Reformulation Study: Phase I

Archaeological Survey. Prepared for the U.S. Army Corps of Engineers, New York District.

The Greeley-Polhemus Group, Inc. and Dolan Research. 1997. Fire Island Inlet to Montauk Point, Long Island, Suffolk County, New York, Reach 2: Interim Project West of Shinnecock Inlet. Prepared for the U.S. Army Corps of Engineers, New York District.

Hoopes, E. M. 1993. Relationship Between Human Recreation and Piping Plover Foraging Ecology, and Chick Survival. M.S. Thesis, University of Massachusetts, Amherst, MA. 106 pp.

Houghton, L.M., J.D. Fraser, and S.P. Elias-Gerken. July 1997. Final Report. Monitoring Study: Effects of the Westhampton Interim Storm Damage Protection Project on Piping Plover Habitat at Pikes Beach, Village of Westhampton Dunes, NY. Interim Report for the 1996 Breeding Season. Virginia Polytechnic Institute and State University, Blacksburg, VA.

Houghton, L.M., J.D. Fraser and S.P. Elias-Gerken. February 1998. Final Report. Monitoring Study: Short Term Effects of the Westhampton Interim Storm Damage Protection Project on Piping Plover Habitat at the Village of Westhampton Dunes and Westhampton Beach, NY. Interim Report for the 1997 Breeding Season. Virginia Polytechnic Institute and State University, Blacksburg, VA.

Houghton, L.M., J.D. Fraser and S.P. Elias-Gerken. February 1999. Final Report. Effects of the Westhampton Interim Storm Damage Protection Project on Piping Plover Habitat at the village of West Hampton Dunes and Westhampton Beach, Long Island, New York. Virginia Polytechnic Institute and State University, Blackburg, VA.

Howard, J.M., Safran, R. J., and Melvin, S. M. 1993. Biology and Conservation of Piping Plovers at Breezy Point, New York. Unpublished Report. Department of Forestry and Wildlife Management, University of Massachusetts, Amherst, MA. 34 pp.

JMA (John Milner Associates), "Cultural Resources Study, Fire Island Inlet to Montauk Point, Suffolk County, New York, Reformulation Study: Phase I Archaeological Survey Volumes I and II," 1998.

JMA (John Milner Associates), "Cultural Resources Baseline Study, Fire Island Inlet to Montauk Point, Suffolk County, New York, Reformulation Study," 2000.
Jones, L. K. 1997. Piping Plover Habitat Selection, Home Range, and Reproductive Success at Cape Cod National Seashore, Massachusetts, M.S. Thesis, University of Massachusetts, Amherst, MA. 96 pp.

LaSalle, M.W. 1986. Seasonal Restrictions on Dredging and Disposal Techniques, WES Draft Report J650-86-007/1366.

Leatherman, S.P. 1982. Barrier Island Handbook. Second Edition. 109 pp.

Leatherman, S.P. and J.R. Allen, 1985. Final Report: Geomorphic Analysis of South Shore of Long Island Barriers, New York. Report prepared for New York District Army Corps of Engineers, by National Park Service, Boston, Massachussetts.

Linck, Dana. 1988. *Archeological Inventory for the William Floyd Estate*. NPS, Denver Service Center, Applied Archeology Center.

Loegering, J. P. 1992. Piping plover breeding biology, foraging ecology, and behavior on Assateague Island National Seashore, Maryland. M.S. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA. 247 pp.

Long Island Regional Planning Board, 1990. Proposed Long Island South Shore Hazard Management Program for Nassau and Suffolk Counties. Hauppauge, NY.

McCormick, Jack and Associates, Inc. 1975 “Environmental Inventory of the Fire Island National Seashore and the William Floyd Estate, Suffolk County, New York.” Report prepared for the National Park Service, Denver Colorado under Contract No. 2000-4-0010/. In *Draft Environmental Impact Statement – Atlantic Coast of Long Island Fire Island to Montauk Point, NY – Reach 1 – Fire Island Inlet to Moriches Inlet Interim Storm Damage Protection Project Suffolk County, New York*. USACE, 1999.

Melvin, S. M., Hoopes, E. M., and Griffin, C. R. 1992. Relationships between human recreation and Piping plover foraging ecology and chick survival. Massachusetts Division of Fisheries and Wildlife, Westboro, MA.

Miyara, Federico. 1998. “Sound Levels.” Scientific Interdisciplinary Ecology and Noise Committee. Argentina.

Naqvi, S.M. and E.J. Pullen. 1982. Effect of Beach Nourishment and Borrowing on Marine Organisms. Miscellaneous Report No. 82-14. U.S. Army Corps of Engineers Coastal Engineering Research Center.

National Park Service and Maryland Department of Natural Resources. 1993-1997. Management and Monitoring of the Piping Plover at Assateague Island National Seashore, Berlin, MD. Annual Reports.

National Park Service, U. S. Department of the Interior

1979 *Fire Island National Seashore, Cultural Resources Inventory*. NPS, Northeast Regional Office, Boston, MA.

2000a *Management Policies 2001.* Washington, DC. Available at <http://www.nps.gov>.

2000b *Strategic Plan for Fire Island National Seashore (October 1, 2000 – September 30, 2005*). On file at Fire Island National Seashore, Patchogue, NY. Available at <www.nps.gov/fiis/stratplanFY01-05.htm>.

2001a *Director's Order #12: Conservation Planning, Environmental Impact Analysis, and Decision-making,* and *Handbook.* Washington, DC. Available at <http://www.nps.gov/policy/DOrders/DOrder12.html> and http://www.nps.gov/policy/DOrders/RM12.pdf>.

2001b. Distribution and abundance of listed terrestrial vertebrate and vascular plant species on Fire Island: ocean beaches and inter- dune swales, by Ernest Taylor, Wildlife Biologist, Division of Natural Resources. Revision of Dec. 14, 2000, report on file at Fire Island National Seashore, Patchogue, NY.

2003 Invasive Plant Report for Fire Island National Seashore.

New York Audubon Society. 2002 *New York State Important Bird Areas.* National Audubon Society of New York State. Available at <http://ny.audubon.org>.

New York Department of Environmental Conservation. 1998a. Roseate Tern Fact Sheet. Endangered Species Unit. Delmar, NY.

New York Department of Environmental Conservation. 1998b. 1997 Long Island Colonial Waterbird and Piping Plover Survey. Non-game and Habitat Unit. Delmar, NY.

New York Department of Environmental Conservation. 1998c. Least Tern Fact Sheet. Endangered Species Unit. Delmar, NY.

New York Department of Environmental Conservation. 1998d. Common Tern Fact Sheet. Endangered Species Unit. Delmar, NY.

New York Department of Environmental Conservation. 1999a. Green Sea Turtle Fact Sheet. Endangered Species Unit. Delmar, NY.

New York Department of Environmental Conservation. 1999b. Loggerhead Sea Turtle Fact Sheet. Endangered Species Unit. Delmar, NY.

New York Department of Environmental Conservation. 1999c. Atlantic Ridley Sea Turtle Fact Sheet. Endangered Species Unit. Delmar, NY.

New York Department of Environmental Conservation. 2000. Piping Plover Fact Sheet. Endangered Species Unit. Delmar, NY.

New York State Department of State 1998a *South Shore Estuary Reserve Technical Report Series – Waterfowl.* Prepared for the South Shore Estuary Reserve Council by the New York State Department of State in cooperation with the United States Fish and Wildlife Service. Albany, NY.

New York State Department of Environmental Conservation. 1998b. NY Natural Heritage Program Natural Heritage Database Report on Rare Species and Ecological Communities. Site Specific Report: Fire Island Inlet to Moriches Inlet.

New York State Department of State 1999a *South Shore Estuary Reserve Technical Report Series - Molluscan Shellfish.* Prepared for the South Shore Estuary Reserve Council by the New York State Department of State in cooperation with the United States Fish and Wildlife Service. Albany, NY.

New York State Department of State 1999b *South Shore Estuary Reserve Technical Report Series - Crustacean Shellfish.* Prepared for the South Shore Estuary Reserve Council by the New York State Department of State in cooperation with the United States Fish and Wildlife Service. Albany, NY.

2002"New York Department of State Coastal Resources Consistency Review." Albany, NY. Available at <www.dos.state.ny.us/cstl/cstlcr.html#policies>.

Psuty, Norbert, P. and Tammy A. Piccola, 1991. Foredune Profile Changes, Fire Island, New York 1982 – 1991. Division of Coastal and Environmental Studeis, Institue of Marine and Coastal Sciences. Rutgers University, NJ.

Raposa, Kenneth B. and Oviatt, Candace A. A Field Evaluation of Fire Island National Seashore Estuarine Resources with an Emphasis on Nekton Communities. Boston, MA: U.S. Department of Interior, National Park Service, New England Support Office, Natural Resources Management; 1997 Aug135 p.

Ray, G. and D. Clarke, 1995. Preconstruction Monitoring for Reach 1 of the Asbury/Manasquan Section of the Atlantic Coast of New Jersey Sandy Hook to Barnegat Inlet Beach Erosion Control Project. Interim report prepared for U.S. Army Engineer District, New York by U.S. Army Corps of Engineers, Waterways Experiment Station.

Reiss, Warren. 1995. Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, Fire Island to Moriches Inlet Interim, Suffolk County, New York.. Prepared by Moffatt and Nichol, Engineers

in affiliation with Ocean Surveys, Inc. Prepared for the U.S. Army Corps of Engineers, New
York District.

RMC Environmental Services. 1996. Fire Island Inlet to Montauk Point Reformulation. Borrow Sites Macroinvertebrate Community Characterization. Prepared for U.S. Army Corps of Engineers Contract No. DACW51-94-D-0035.

Salisbury, E. J. 1952. Downs and Dunes, Their Plant Life and its Environment. G. Bell and Sons, London.

Schwab, W.C., E.R. Thieler, J.R. Allen, D.S. Foster, B.A. Smith, and J.F. Denny. 2000. Influence of inner-continental shelf geologic framework on the evolution and behavior of the barrier-island system between Fire Island Inlet and Shinnecock Inlet, Long Island NY. Journal of Coastal Research 16:408-422.

Sherk, J.A., Jr. 1971. The Effects of Suspended and Deposited Sediments on Estuarine Organisms: Literature summary and research needs. Chesapeake Biol. Lab. Contrib. No. 443. Solomons, MD. 73 pp

Steimle, F.W. and R.B. Stone. 1973. Abundance and Distribution of Inshore Benthic Fauna Off Southwest Long Island, New York. NOAA Tech. Rpt. NMFS SSFS-673.

Strauss, E. 1990. Reproductive success, life history patterns, and behavioral variation in populations of Piping plovers subjected to human disturbance (1982-1989). Ph.D. Dissertation, Tufts University, Medford, MA. 143 pp.

Suffolk County. 1999. Draft South Shore Estuary Reserve Surface Water Quality Monitoring Report 1977-1997, Volume 1, Narrative. Department of Health Services. Riverhead, NY.

Tangren, S., A. 1988. A Geologic Investigation of the Salt Marsh System of Great South Bay. State University of New York at Stony Brook. p. 66. MS Thesis.

Tuttle, M. C., "Remote Sensing Survey, Tidal Zone and Nearshore Project Area, Atlantic Coast of Long Island, Fire Island Inlet to Moriches Inlet," Panamerican Consultants, Inc., Memphis, 1999.

U.S. Army Corps of Engineers. 1975. Shore Protection Manual, Volume 1. U.S. Army Coastal Engineering Research Center. Fort Belvoir, VA.

U.S. Army Corps of Engineers, New York District. 1991. Final Environmental Impact Statement. Use of Subaqueous Borrow Pits for the Disposal of Dredged Material from the Port of New York-New Jersey.

U.S. Army Corps of Engineers. 1998. Draft Pre-Construction Baseline Studies Report: The New York District's Biological Monitoring Program for the Atlantic Coast of New Jersey, Asbury to Manasquan Section, Beach Erosion Control Project, Phase I. US Army Corps of Engineers, New York District.

ACOE. 1999. Draft Environmental Impact Statement. Atlantic Coast of Long Island, Fire Island to Montauk Point. Reach I-Evaluation of Interim Plan for Storm Damage Reduction. ACOE. New York District.

U.S. Fish and Wildlife Service. 1988. Atlantic Coast Piping Plover Recovery Plan. Region 5. Newton Corner, MA.

US Fish & Wildlife Service, November 1998. Draft Fish and Wildlife Coordination Act Section 2(b) Report: Fire Island Inlet to Montauk Point Beach Erosion Control, and Hurricane Protection
Project, Reach 2 – Moriches Inlet to Shinnecock Inlet Interim Storm Damage Protection Plan. US Fish & Wildlife Service, Islip, New York.

Watts Jr., Gordon. 2001. Remote sensing archaeological survey of borrow areas 2A, 2B, 2C, 3A, 4A, 4B, 5A, 5B, 6A, 7A, 8A, Atlantic coast of Long Island, Fire Island Inlet to Moriches Inlet, Suffolk County, New York, Reformulation Study. Tidewater Atlantic Research, Inc.

Wells, B.W. and I.V. Shunk. 1938. Salt spray, an important factor in coastal ecology. Bulletin of the Torrey Botanical Club 65:485-492.

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Appendices
Appendix A – Record of Non-applicability. 40 CFR Part 51.

Appendix A

Record of Non-applicability of Conformity Rule (40 CFR Part 51, subpart W) for the Dredging and Beach Scraping activities located on Fire Island for Fall 2003 – Winter 2005

PROJECT TITLE: Dredging and Beach Scraping at Fire Island National Seashore

DESCRIPTION OF PROPOSED ACTION: The United States National Park Service, Fire Island National Seashore is going to be issuing Special Use Permits for beach nourishment and scraping projects located in front of the beach communities on Fire Island.

ANTICIPATED DATE AND DURATION OF PROPOSED ACTION: These projects will each be undertaken separately and will be funded with private funds collected and generated by each community.

REASON FOR USING RECORD OF NON-APPLICABILITY: Conformity under the Clean Air Act, Section 176 has been evaluated for the above-described action per 40 CFR 51, and the requirements of the rule are not applicable because the direct and indirect emissions from the project have been estimated to be below the de minimis threshold established at 40 CFR 51.853, with the exception of NOx emissions, which will be 99.99% emitted at the offshore dredge. These emissions will sufficiently mix and be diluted before reaching any part of Long Island or the mainland due to the borrow area being located approximately 1 mile offshore. Since the prevailing winds are from the West, it is estimated that the minimum distance for the emissions from the dredge to the mainland will be 2 miles. That 2 miles or further, combined with the time frame for these projects which is from October – December, outside of the peak ozone season for the region, is predicted to minimize the overall impacts of the produced NOx on the Ozone production in the region. Supporting documentation is attached.

EMISSION CALCULATIONS

DIESEL CONSUMPTION PER DAY

Hydraulic dredge 10,000 gal
Tender 20 gal
2 1/2T truck - 20 gal x 2 trucks
5cy loader - 50 gal
backhoe or equivalent - 40 gal
bulldozer – 50 X 2 = 100
contact truck - 20 gal

Total daily = 10,270 gallons

20 days over 2 months = 10,270 x 20 = 205,400 gallons diesel used during construction

Total Estimated Emissions using the above number of gallons

NOx = 4.41 lb/MMBtu (140MMBtu/10^3gal) = 617.4 lb/10^3gal x 205x10^3 gal = 127K lbs/2K lbs/ton = 64 tons

CO = 0.95 lb/MMBtu (140 MMBtu/10^3gal) = 133.0 lb/10^3gal x 205x10^3 gal = 27.3K lbs/2K lbs/ton = 14 tons

SOx = 0.29 lb/MMBtu (140 MMBtu/10^3gal) = 40.6 lb/10^3gal x 205x10^3 gal = 8.32K lbs/2K lbs/ton = 4.2 tons

PM-10 = 0.31 lb/MMBtu(140 MMBtu/10^3gal) = 43.4 lb/10^3gal x 205x10^3 gal = 8.90K lbs/2K lbs/ton = 4.5 tons

CO_2 = 164 lb/MMBtu(140MMBtu/10^3gal) = 22960 lb/10^3gal x 205x10^3 gal = 4,710K lbs/2K lbs/ton = 2,400 tons

VOC = 0.36 lb/MMBtu(140 MMBtu/10^3gal) = 50.4 lb/10^3gal x 205x10^3 gal =10.3K lbs/2Klbs/ton = 5.2 tons

* The emission factors for Diesel Fuel in (lb/MMBtu) found in Table 3.3-1 (p. 3.3-6) of the following reference are converted to lb/10^3gal by multiplying by 140. This factor comes from section 1.3, p.8, last paragraph. REFERENCE: EPA. 1995. Section 1.3, Fuel Oil Combustion. In: Compilation of Air Pollutant

Emission Factors, Volume 1: Stationary Point and Area Sources, Fifth Edition, AP-42. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, North Carolina.

Table 1 comparing EPA thresholds to potential emissions from the a maximum representative example of individual dredging project that may take place on Fire Island based on the proposal in the Environmental Assessment

	EPA Thresholds	Potential
	Tons/yr	**Tons**
NO_x	25	64
CO	100	14
SO_x	100	4.2
PM-10:	70	4.5
VOC	25	5.2

§51.853 Applicability.

(a) Conformity determinations for Federal actions related to transportation plans, programs, and projects developed, funded, or approved under title 23 U.S.C. or the Federal Transit Act (49 U.S.C. 1601 *et seq.*) must meet the procedures and criteria of 40 CFR part 51, subpart T, in lieu of the procedures set forth in this subpart.

(b) For Federal actions not covered by paragraph (a) of this section, a conformity determination is required for each pollutant where the total of direct and indirect emissions in a nonattainment or maintenance area caused by a Federal action would equal or exceed any of the rates in paragraphs (b)(1) or (2) of this section.

(1) For purposes of paragraph (b) of this section, the following rates apply in nonattainment areas (NAAs):

-	Tons/year
Ozone (VOC's or NO_X):	-
Serious NAA's	50
Severe NAA's	25
Extreme NAA's	10
Other ozone NAA's outside an ozone transport region	100
Marginal and moderate NAA's inside an ozone transport region:	-
VOC	50
NO_X	100
Carbon monoxide: All NAA's	100
SO_2 or NO_2: All NAA's	100
PM-10:	-
Moderate NAA's	100
Serious NAA's	70
Pb: All NAA's	25